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Jechnical Report TR 83-10 November 1988



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CLIMATOLOGY OF NORTH PACIFIC TROPICAL CYCLONE TRACKS

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Naval Environmental Prediction Research Facility



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1. INTRODUCTION

This North Pacific tropical cyclone climatology was compiled at the suggestion of the Environmental Group, U.S. Pacific Command. The climatology is designed to serve as an updated forecast reference for Joint Typhoon Warning Center (JTWC) forecasters, a planning aid to assist fleet scheduling personnel, a decision-making aid for U.S. Pacific commanding officers, and a source of general climatic knowledge about tropical cyclones in the North Pacific basin.

No attempt has been made here to produce a general tropical climatology. All statistics provided are those related solely and directly to tropical cyclone tracks. The information is presented in four types of charts: mean paths, actual tracks, constancy and relative frequency, and speed of movement.

Guidance on chart usage is given in para. 3 and a key to charts sequencing is given in para. 4. Data sources and compilation procedures are described in para. 2.

2. DATA

2.1 Data Sources

The data used to develop this climatology were obtained from two sources. For the period of 1959-87 in the western North.

Pacific, the data were extracted from the JTWC Tropical Cyclone Data Base maintained at the Fleet Numerical Oceanography Center, Monterey, CA. The latitude, longitude, and intensity (maximum surface wind speed) for each tropical cyclone are given at 6-hour

intervals. These positions represent a tropical cyclone's best track, which is a subjectively-smoothed path determined in the post-storm analysis.

For the western North Pacific (1945-1958) and eastern North Pacific (1949-1982), the data were taken from the Consolidated World-Wide Tropical Cyclone Data Base, National Climatic Data Center, Asheville, NC. These data, given at 12-hour intervals, were interpolated to 6-hourly positions before they were used in the analyses and calculations. The interpolation was accomplished by the Akima method.*

(It should be noted that the placing in service of the first meteorological satellite in 1960 greatly enhanced meteorologists' abilities to locate and track tropical cyclones in data-sparse areas. This improvement applies more to the eastern Pacific than to the western Pacific, however, because there was much more storm reporting from increased ship traffic and aircraft reconnaissance in the western region after World War II.)

2.2 Tropical Cyclone Intensities

Tropical cyclones that failed to attain at least tropical storm intensity (maximum surface wind speed greater than 33 kt) were not considered for this study. Because intensities were not given for tropical cyclones occurring before 1973 in the eastern North Pacific basin, all tropical cyclones prior to 1973 were considered in this study.

^{*}Akima, H., 1970: "A New Method of Interpolation and Smooth Curve Fitting Based on Local Procedures," J. Assoc. Comp. Mach., 17, 589-602.

2.3 Background

Table 1 gives background information on the tropical cyclones (> 33 kt) from the two basins. The subjective path classification of straight, recurver, or "other" was made for both basins. A straight tropical cyclone is one whose general direction of movement remained constant throughout its life with a heading between 250° and 360°. A recurver is defined as a tropical cyclone that turned from its initial westward or northwestward path to a path toward the north or northeast. A tropical cyclone that did not fit into either the straight or recurver categories is classified as "other."

Note that some of the tracks may appear to have been incorrectly classified. This generally was due to considerations of storm intensity during the time in question. For example, an erratic track during the formative or dissipative stages of a tropical cyclone does not automatically classify that tropical cyclone as "other."

Intensity statistics were based only on tropical cyclones whose intensities were known.

3. CHARTS

3.1 Timeframe

The tropical cyclone occurrences were divided into 24 half-month periods, with each period centered on either the 1st or 16th day of the month. A period thus will begin approximately a week before the 1st or 16th, and end approximately a week after

the 1st or 16th, as, for example, in the sequence of periods Dec 24-Jan 8, Jan 9-Jan 23, Jan 24-Feb 8. Any tropical cyclone, however, that occurred within 15 days of either side of the 1st or 16th day, also was included in the period. Tropical cyclones were classified into periods according to their starting dates. Each tropical cyclone belongs to two periods, and in some cases three. The starting date was chosen for classification purposes because, in operational fact, a storm's start date is always known. Thus, there would be no confusion as to which climatological period should be used. The overlapping of periods also avoids confusion about tropical cyclones whose starting dates were near the beginning or end of calendar months.

Table 1. Summary of western and eastern North Pacific Tropical Cyclones

		Weste: (1945-1		Eastern (1949-1982)					
Avg. No. Of Tropical Cyclones (> 33 kts)		25.37/y	ear		/year				
Type:	No.	Percent	Avg. Life (Days)	No.	Percent	Avg. Life (Days)			
Straight Recurver Other	397 464 230	36.4 42.5 21.1	5.77 7.37 6.71	286 62 60	70.1 15.2 14.7	4.58 5.74 5.47			
Total	1091	100.0	6.65	408	100.0	4.89			
Tropical Storms Typhoons/Hurricanes Super Typhoons/ Hurricanes	355 572 162	32.6 52.5 14.9	4.42 7.29 9.32	65 83 1	43.6 55.7 .7	3.85 6.99 11.50			

3.2 Chart Types

Four types of charts are provided for each period: mean paths, actual tracks, constancy and frequency, and average speed of movement. Certain periods may not be statistically significant if less than 5% of the total number of tropical cyclones in the entire data base occurred in these periods.

3.2.1 Mean Paths. These charts show the paths most often followed by tropical cyclones in the period. The numbers on the paths represent the percentage of tropical cyclones for the period that followed the indicated paths. Paths that contained less than 5% of the tropical cyclones for the period were not analyzed. These charts also contain statistics similar to those in Table 1, but only for the applicable period. For a period in which 10 tropical cyclones or fewer occurred, a blank Mean Paths chart containing only the statistics is supplied.

NOTE: When one path branches off into multiple paths, the sum of the percentages on the branches does not necessarily equal the percentage indicated on the parent path. This is due to the fact that not all tropical cyclones follow a mean path, and some develop/dissipate along a path.

Also included on these charts is a dashed line representing the mean recurvature position of recurving tropical cyclones. This line was objectively determined by evaluating the mean recurvature position in 5° longitude bands. If a band contained fewer than five recurvature positions, it was not included in

the analysis. Thus, there are no mean recurvature lines for the entire eastern North Pacific basin due to the low number of recurving tropical cyclones.

3.2.2 Actual Tracks. The best track data are plotted on these charts at six-hour intervals. A dot represents the position of the tropical cyclone when it was first considered to have attained at least tropical depression intensity. The typhoon symbol marks the last position of the tropical cyclone before it became extra-tropical or dissipated. There are nine actual track charts for each period (see para. 4).

3.2.3 Constancy and Frequency. Two numbers were computed and plotted for each 5° square on these charts:

Constancy. The top number is constancy, which is defined as the 12-hr average vector speed of the tropical cyclone divided by the 12-hr average scalar speed multiplied by 100. Both numerator and denominator were computed using all tropical cyclones in the square before the division was performed. Thus, constancy is a measure of confidence in direction persistence. A high constancy rate (90 to 100) means that there is a high likelihood that a tropical cyclone will continue in the same general direction for the next 12 hours. As the constancy decreases, confidence decreases that a tropical cyclone will remain on course.

Frequency. The bottom number is the relative frequency of tropical cyclones passing through the square per year for the time period. A value of 0.25 therefore implies that on the average, a tropical cyclone will pass through the square once every four years for that particular period. The frequency can

value. For example, a square may have a constancy value of 95, but since the relative frequency is only 0.10, the future 12-hr movement of a tropical cyclone in this square is in doubt.

3.2.4 Average Speed of Movement. Isopleths are drawn on these charts to show the mean scalar movement speed of the tropical cyclone in knots. Each tropical cyclone was interpolated to hourly positions using the Akima method. Speeds were averaged for each 5° square (5° latitude x 5° longitude). Those squares that contained 5% or less of the tropical cyclones in the period were not considered in the analysis. The charts also list the average speed and sample size in each square. Note that some of the squares contain unrealistic speed values (e.g., Nov 9 - Nov 23 at 45°N in the western North Facific). This is due to a few tropical cyclones whose tracks could not be verified.

4. KEY TO CHARTS SEQUENCE

Charts are grouped by ocean region: those page-numbered W-1, W-2, W-3 ... are for the <u>western</u> North Pacific; and those page-numbered E-1, E-2, E-3 ... are for the <u>eastern</u> North Pacific.

Within each region, charts are grouped in half-month periods, a total of 24 periods. The periods <u>center</u> on the 1st and 16th days of the month -- thus, for example, periods will begin approximately a week <u>before</u> the 1st or 16th, and end approximately a week <u>after</u> the 1st or 16th: [Dec 24-Jan 8] [Jan 9-Jan 23] [Jan 24-Feb 8] [Feb 9-Feb 23], etc.

within each half-month period, the following charts are provided in sequence:

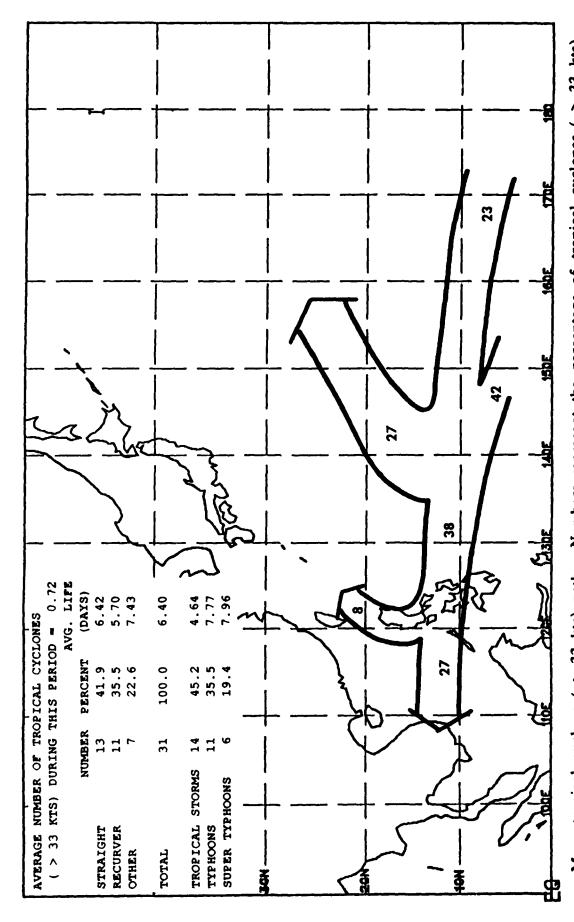
1. Mean Paths

Actual Tracks for

- 2. Straight south of 150N
- 3. Straight north of 15^ON
- 4. Straight all tropical cyclones (in this period)
- 5. Recurving south of 15^ON
- 6. Recurving north of 15⁰N
- 7. Recurving all tropical cyclones (in this period)
- 8. Other (neither clearly straight nor clearly recurving)
 south of 15⁰N
- 9. Other north of 150N
- 10. Other all tropical cyclones (in this period)
- 11. Constancy and Relative Frequency
- 12. Speed of Movement

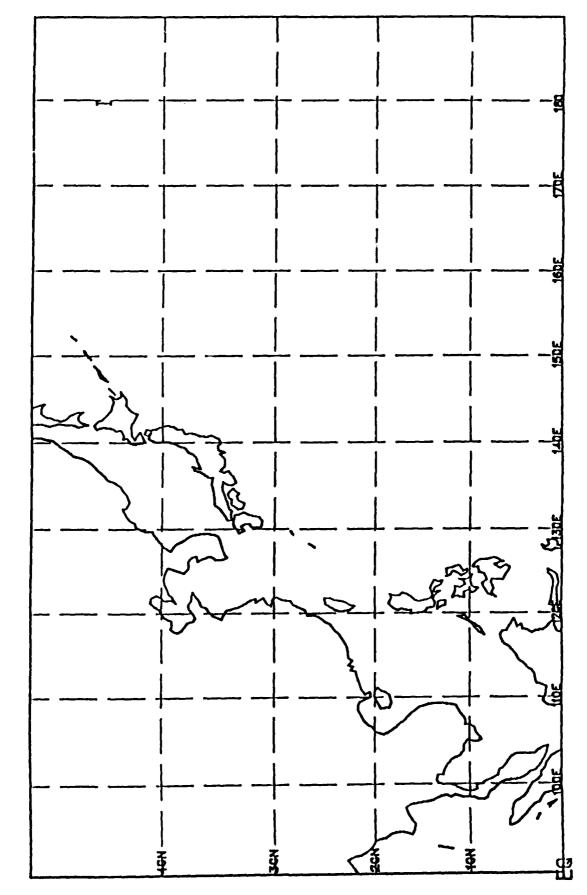
Note: In those few periods when no tropical cyclones occurred, only one chart, with this fact of non-occurrence noted on it, is provided.

MEAN PATHS FOR DEC 24 - JAN 8



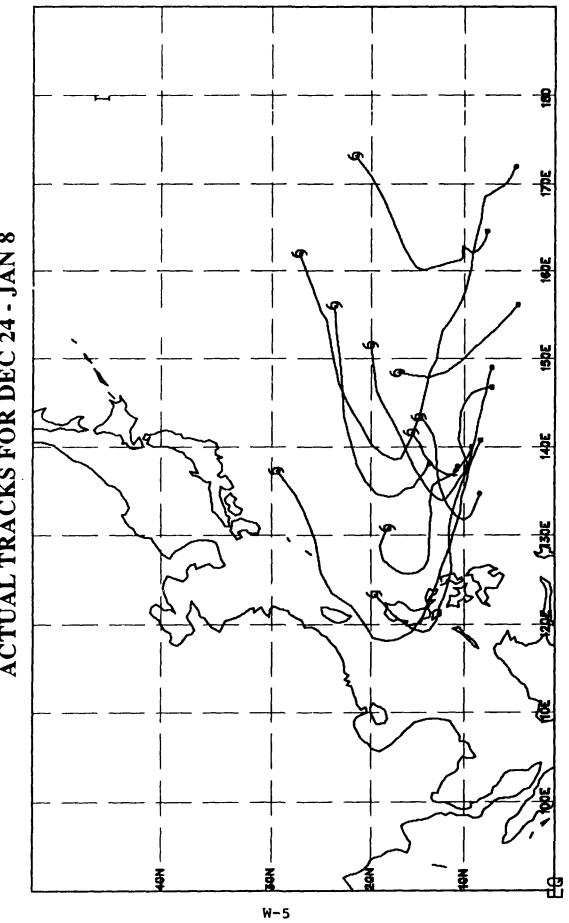
Numbers represent the percentage of tropical cyclones (> 33 kts) numbers may not add up to 100% since not all tropical cyclones develop/dissipate along a path. Tracks which contained less than 5% of the tropical cyclones (> 33 kts) are ignored. These which followed the indicated path. These (> 33 kts) follow a mean path and some Mean tropical cyclone (> 33 kts) path.

Actual path of straight tropical cyclones (> 33 kts) developing south of 150N.

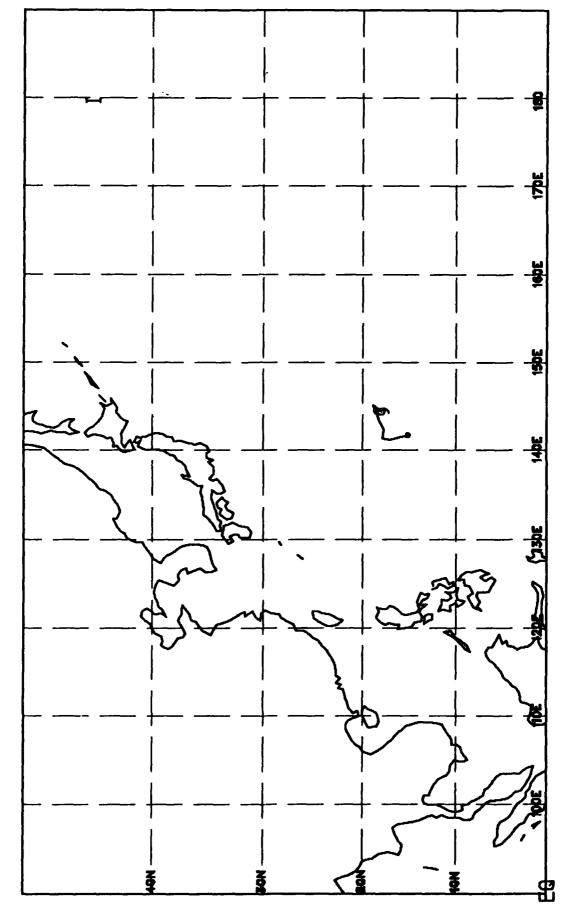


Actual path of straight tropical cyclones (> 33 kts) developing at or north of 15°N.

Acrual path of all straight tropical cyclones (> 33 kts).

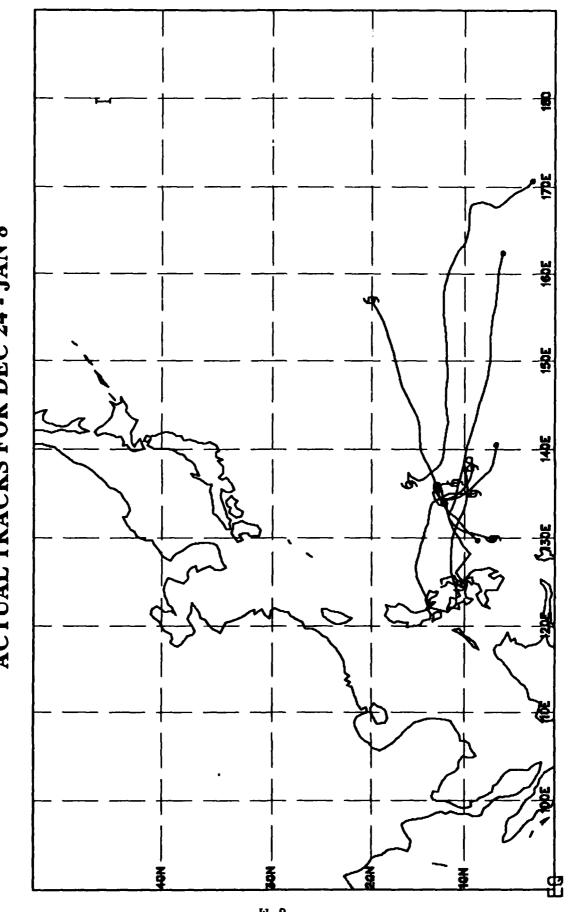


Actual path of recurving tropical cyclones (> 33 kts) developing south of 15°N.

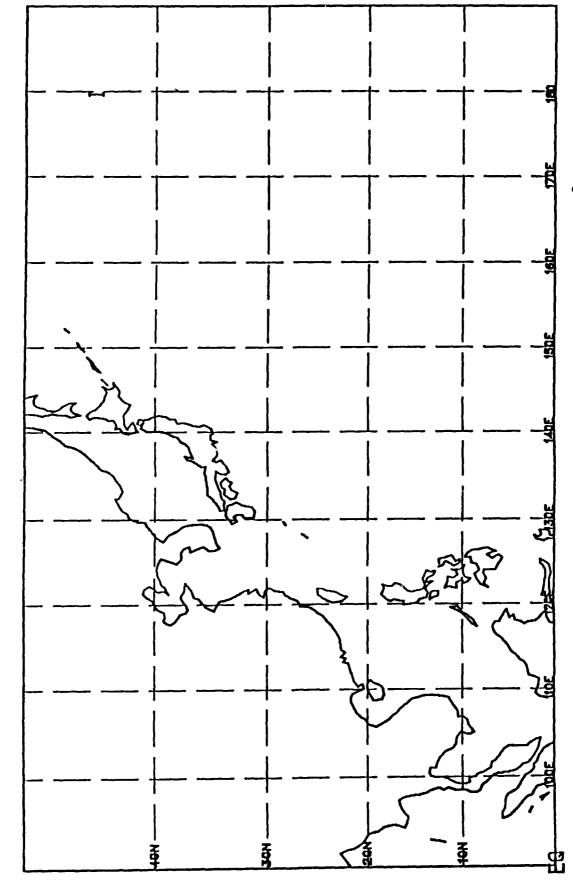


Actual path of recurving tropical cyclones (> 33 kts) developing at or north of 15°N.

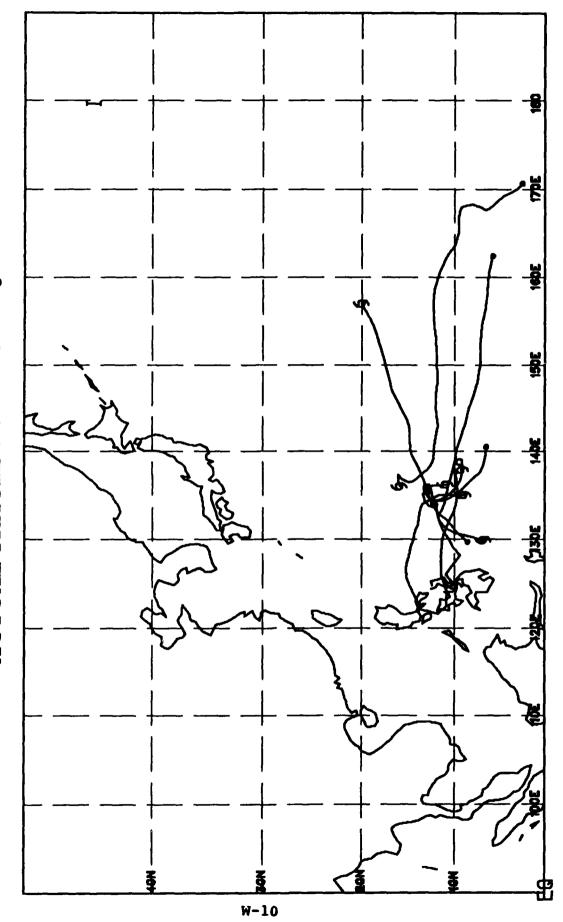
Actual path of all recurving tropical cyclones (> 33 kts).



Actual path of other tropical cyclones (>33 kts) developing south of 15°N.

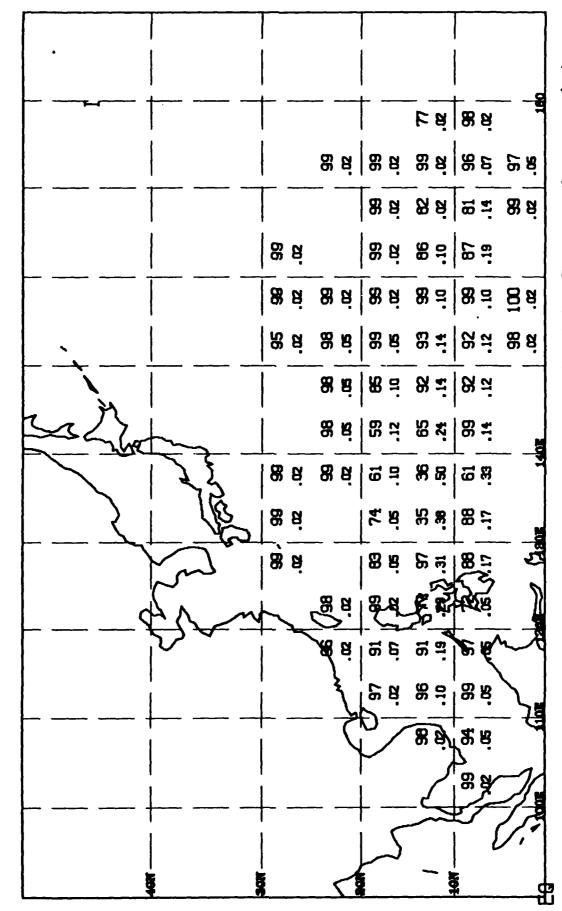


Actual path of other tropical cyclones (> 33 kts) developing at or north of 15°N.



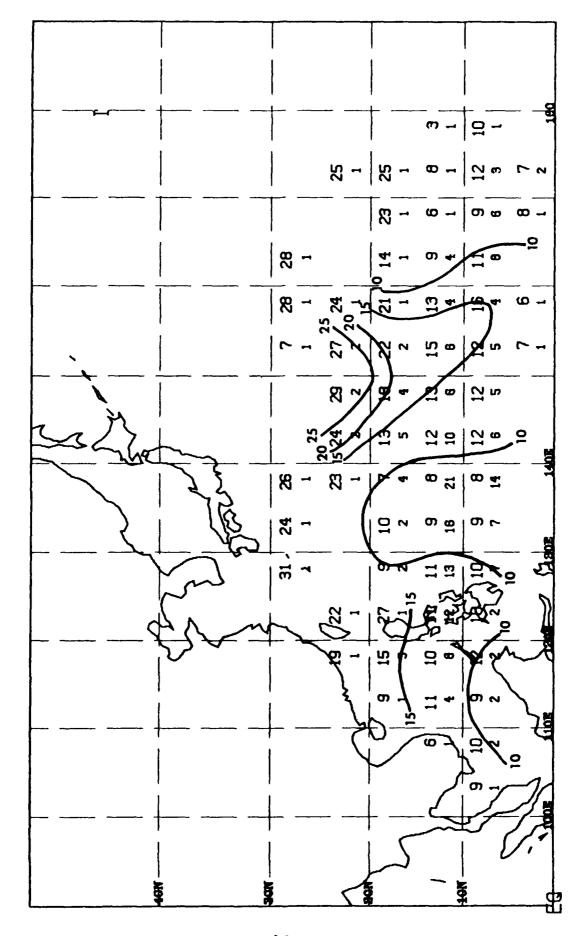
Actual path of all other tropical cyclones (> 33 kts).

CONSTANCY AND RELATIVE FREQUENCY FOR DEC 24 - JAN 8



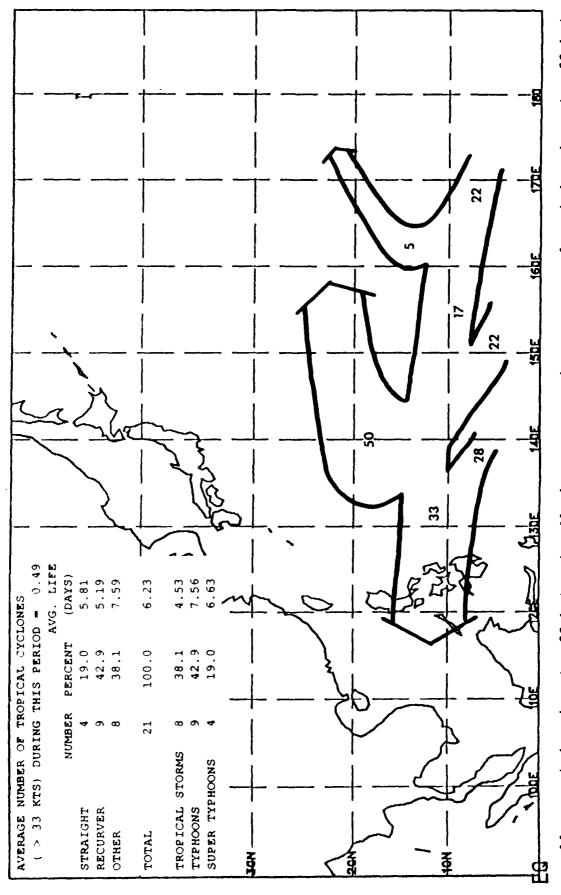
> 33 kts) Constancy (top number) and Relative Frequency (bottom number). as the 12-hr average vector speed divided by the 12-hr average scalar speed. s the number of tropical cyclones passing through the 50 latitude by 50 number of tropical cyclones passing through the 50 latitude Fropical cyclone (> 33 kts) Constancy (top number) time period. longitude square per year per .2 Constancy is defined Relative Frequency i

SPEED OF MOVEMENT FOR DEC 24 - JAN 8

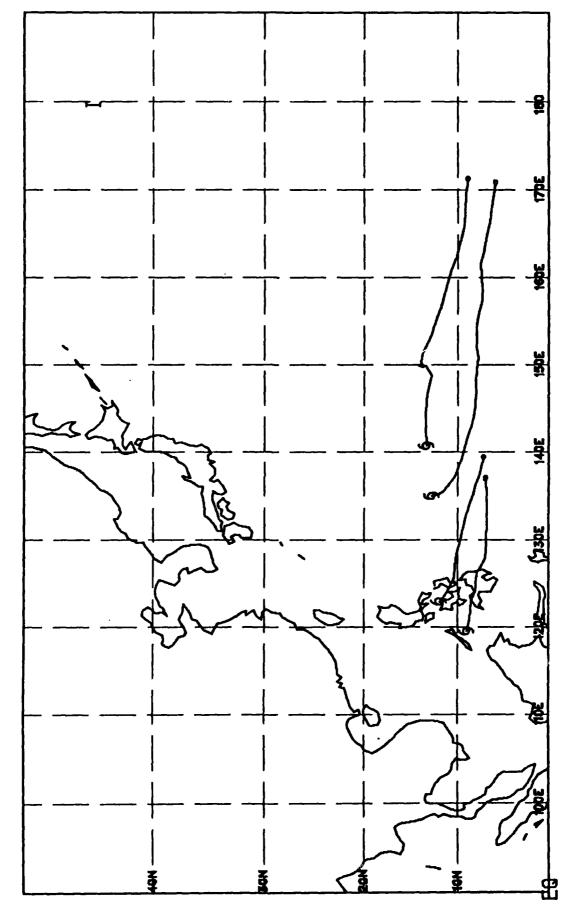


Average tropical cyclone (> 33 kts) Speed (top number) in knots and sample size (bottom number) for each 5° latitude by 5° longitude square. Contours are drawn only to those squares containing at least 5% of the sample.

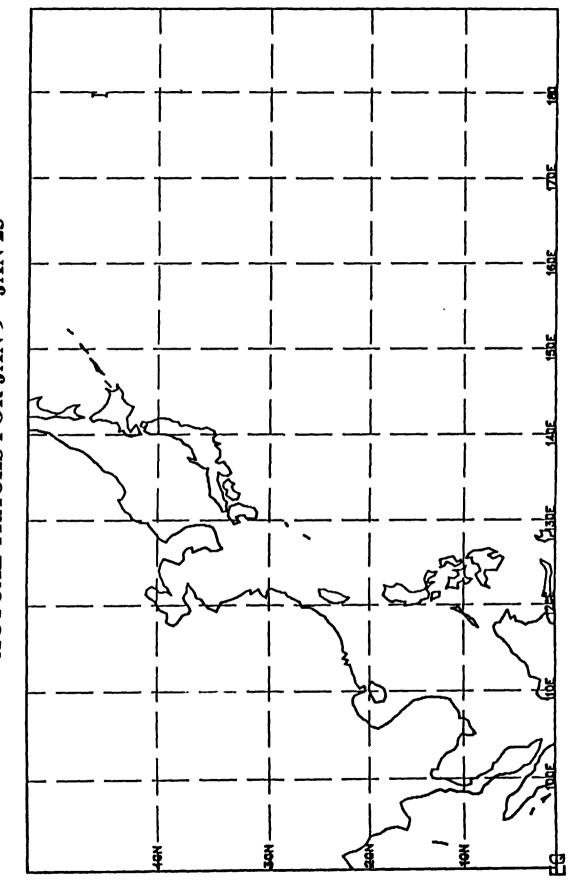
MEAN PATHS FOR JAN 9 - JAN 23



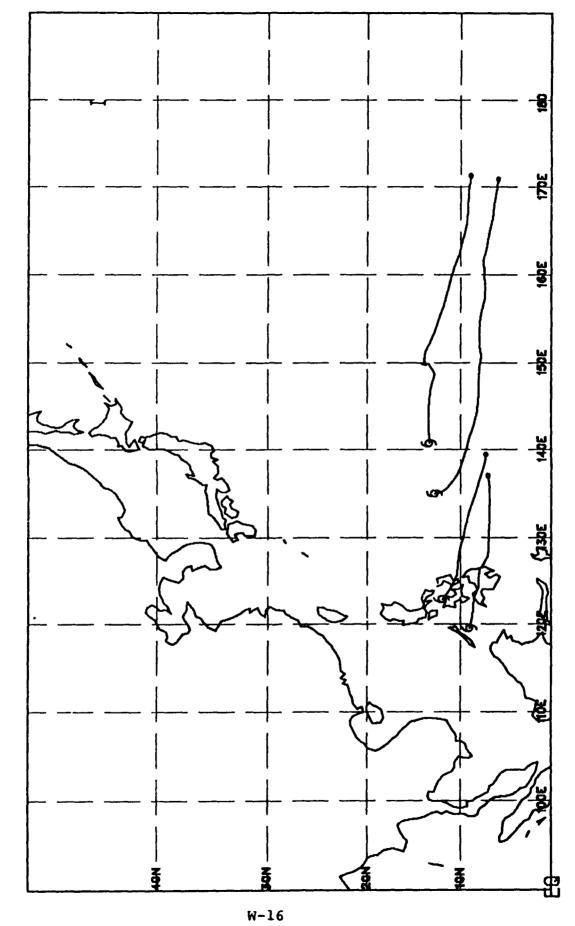
Numbers represent the percentage of tropical cyclones (> 33 kts) numbers may not add up to 100% since not all tropical cyclones develop/dissipate along a path. Tracks which contained less than develop/dissipate along a path. 5% of the tropical cyclones (> 33 kts) are ignored. Mean tropical cyclone (> 33 kts) path. > 33 kts) follow a mean path and some which followed the indicated path.



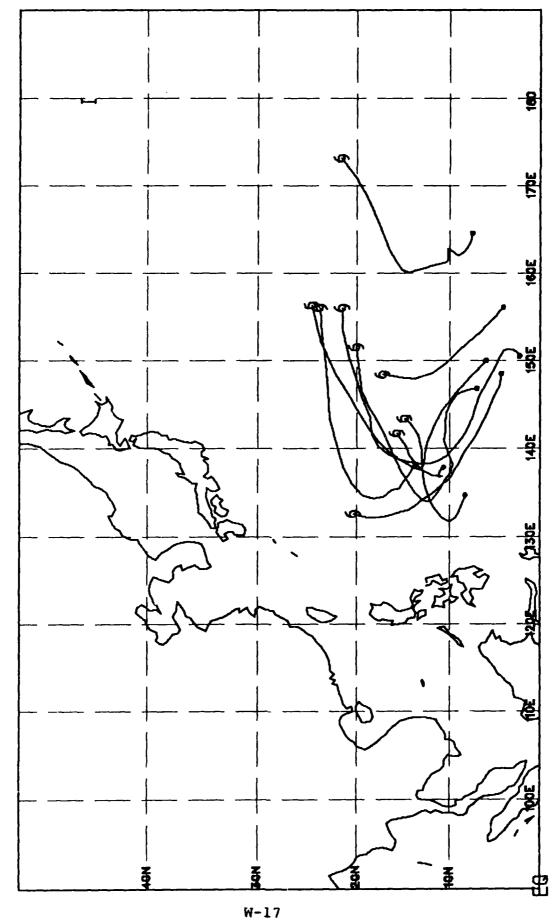
Actual path of straight tropical cyclones (> 33 kts) developing south of 15°N.



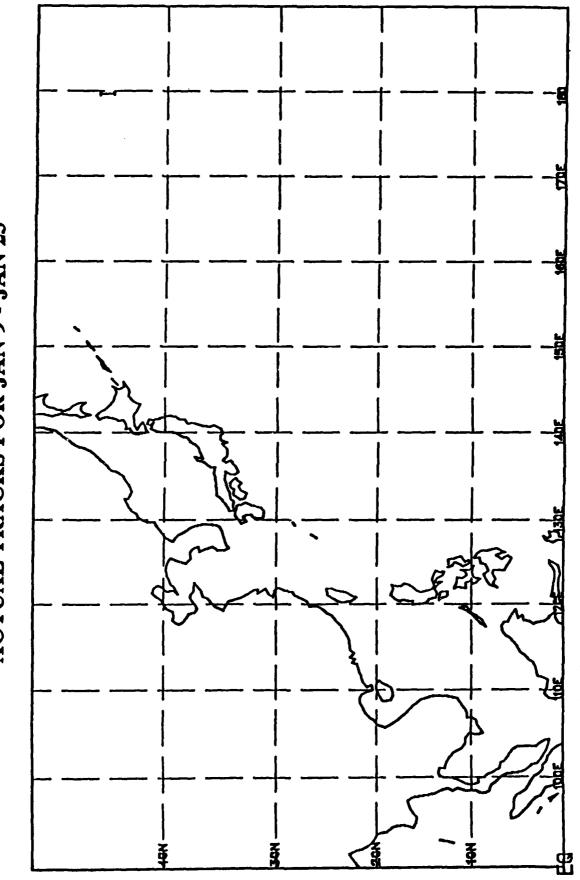
Actual path of straight tropical cyclones (> 33 kts) developing at or north of 15°N.



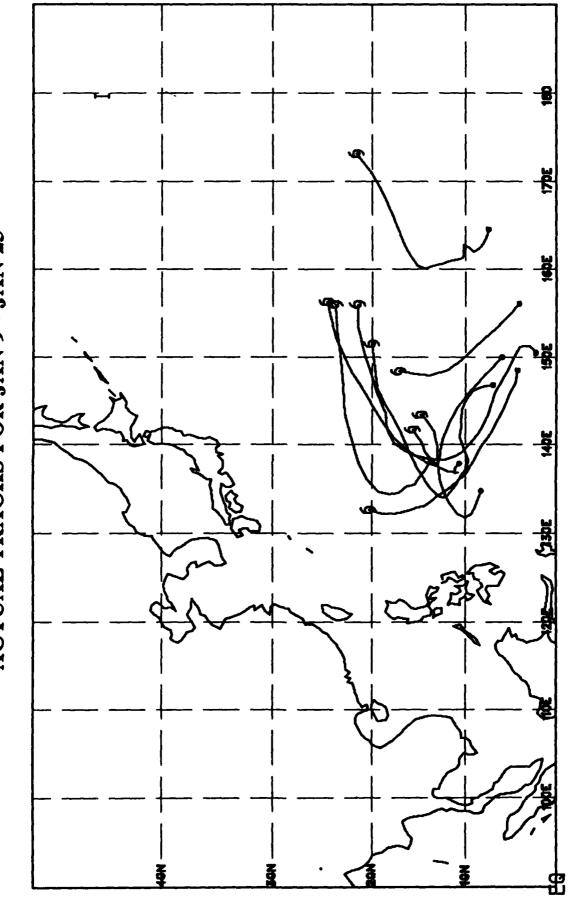
Actual path of all straight tropical cyclones (> 33 kts).



Actual path of recurving tropical cyclones (> 33 kts) developing south of 15°N.

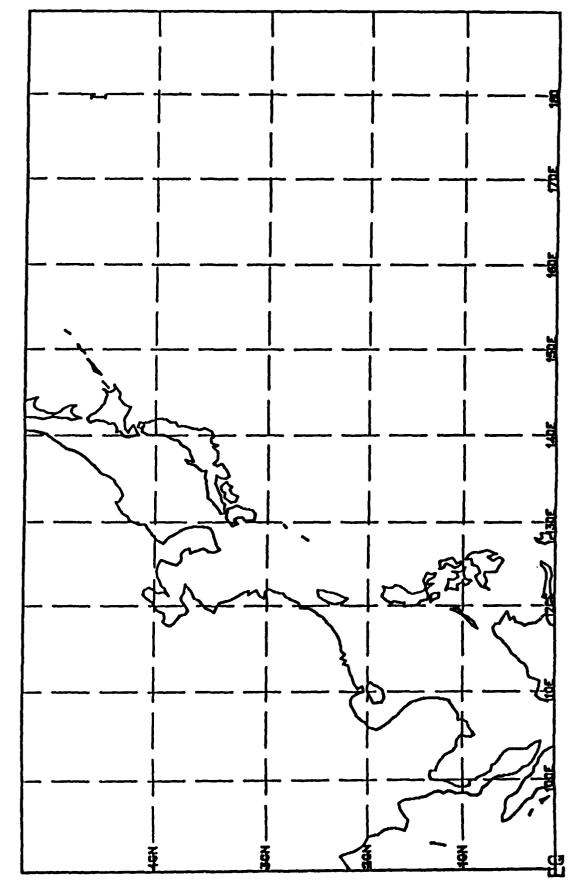


Actual path of recurving tropical cyclones (> 33 kts) developing at or north of 15°N.

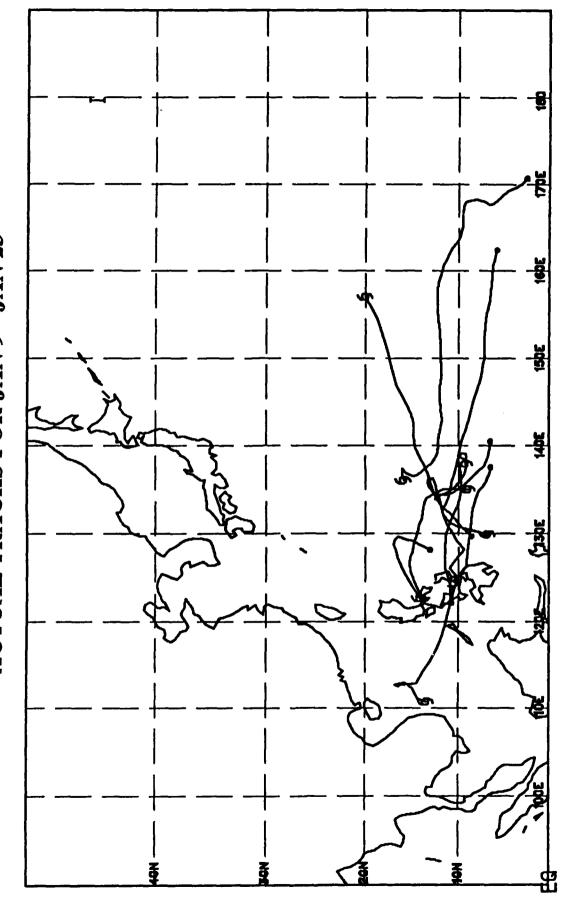


Actual path of all recurving tropical cyclones (> 33 kts).

Actual path of other tropical cyclones (> 33 kts) developing south of 159N.

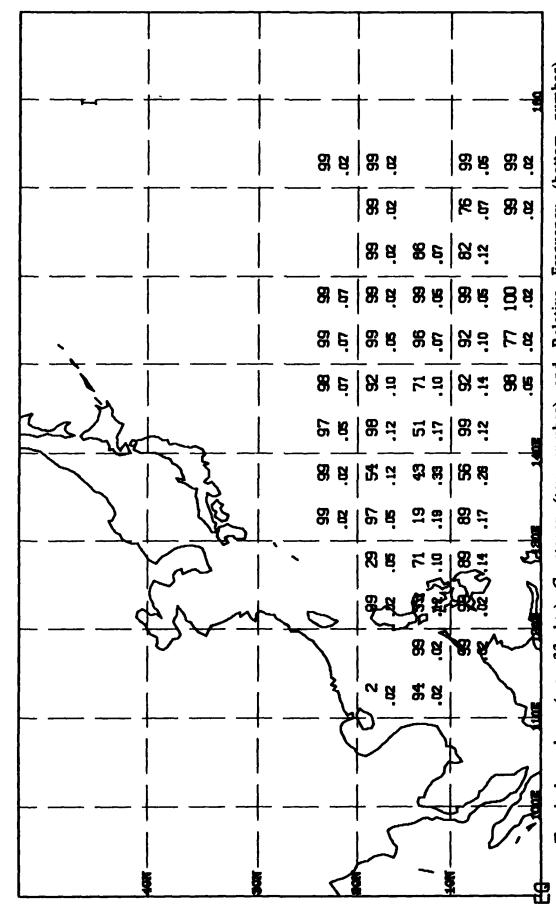


Actual path of other tropical cyclones (> 33 kts) developing at or north of 15°N.



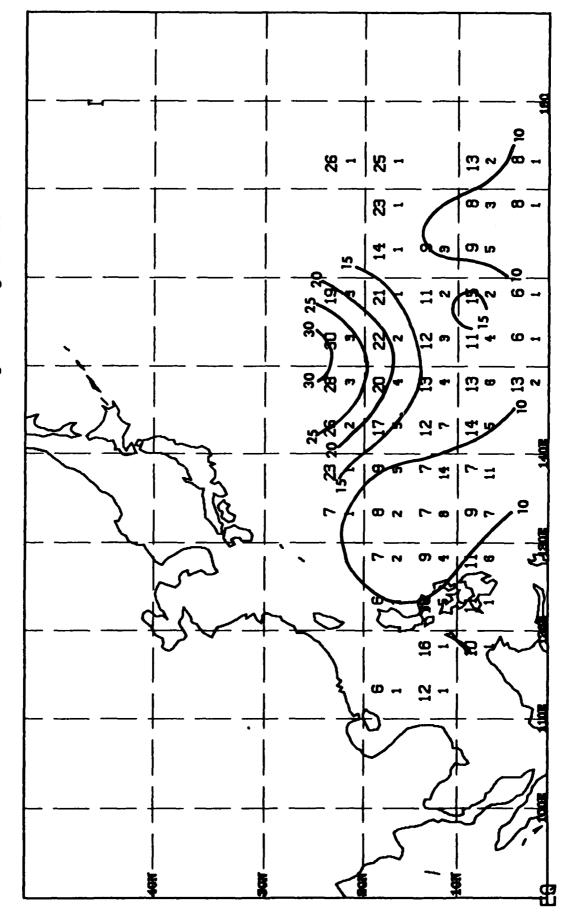
Actual path of all other tropical cyclones (>33 kts).

CONSTANCY AND RELATIVE FREQUENCY FOR JAN 9 - JAN 23



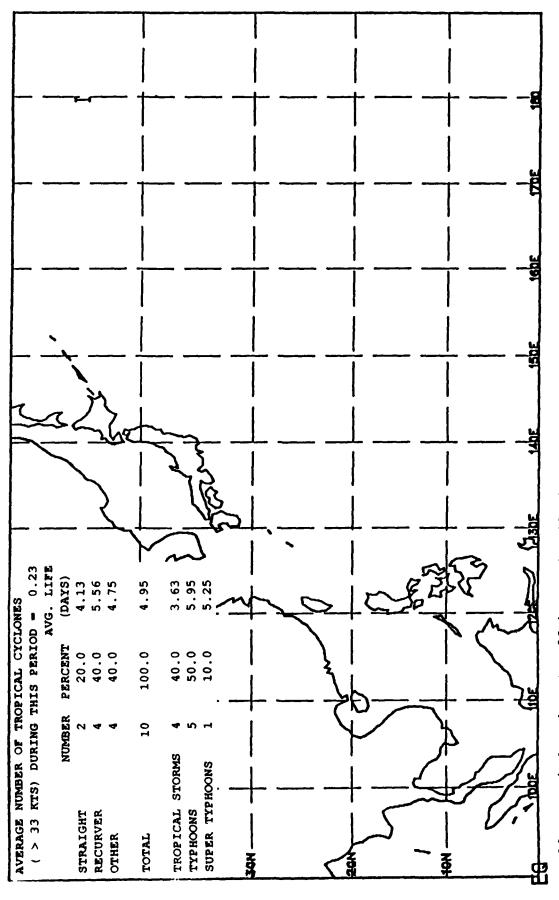
as the 12-hr average vector speed divided by the 12-hr average scalar speed. and Relative Frequency (bottom number). cyclones passing through the number) tropical (top 33 kts) Constancy number of Relative Frequency is the number of longitude square per year per time period. Constancy is defined cyclone (Tropical

SPEED OF MOVEMENT FOR JAN 9 - JAN 23

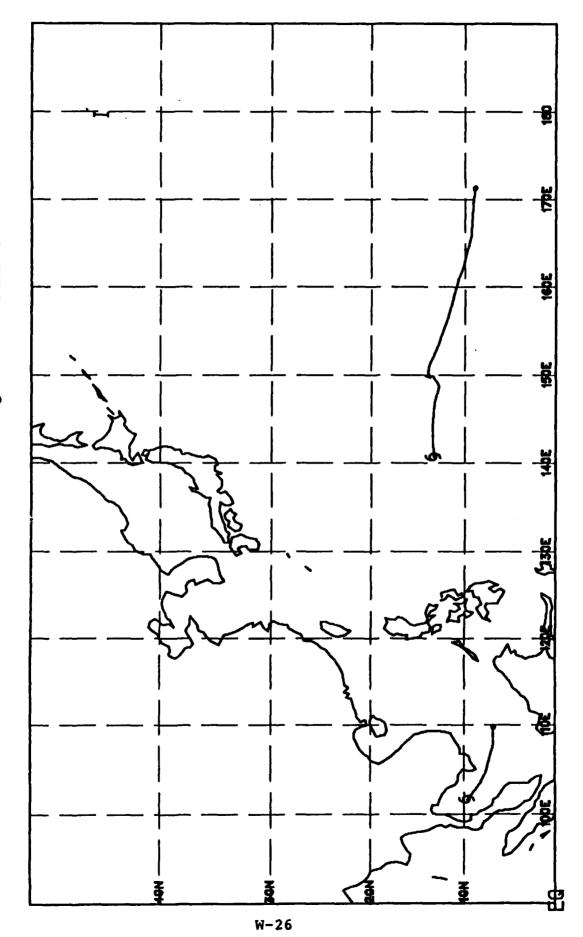


Average tropical cyclone (> 33 kts) Speed (top number) in knots and sample size (bottom number) for each 5° latitude by 5° longitude square. Contours are drawn only to those squares containing at least 5% of the sample.

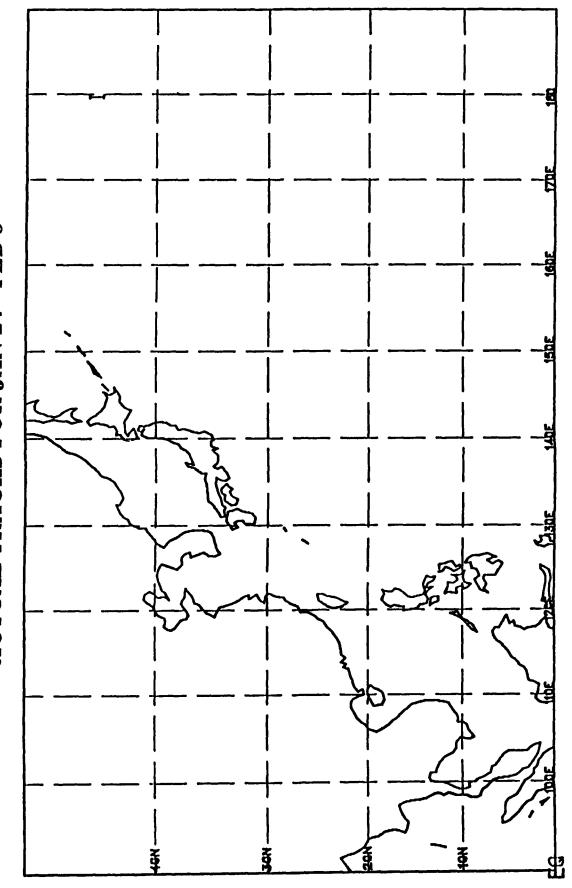
MEAN PATHS FOR JAN 24 - FEB 8



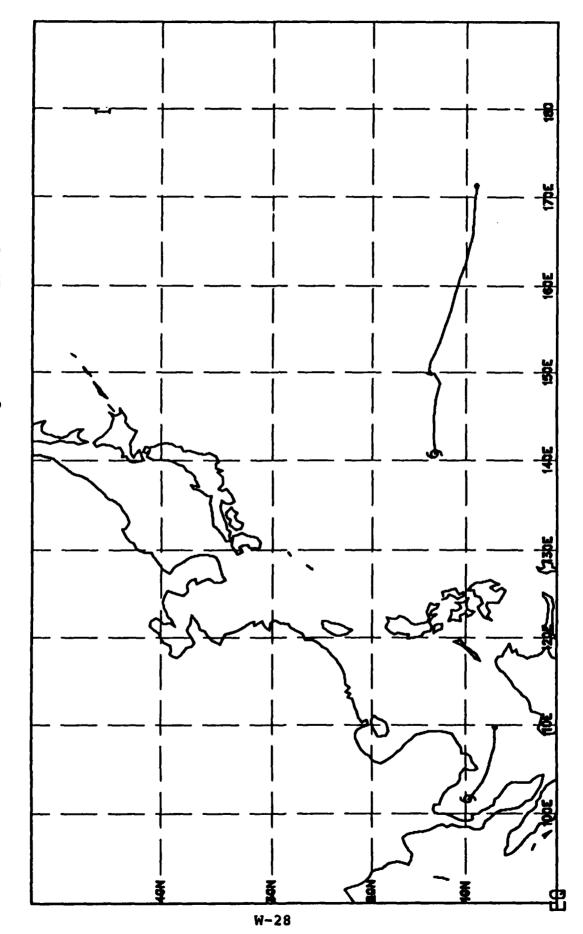
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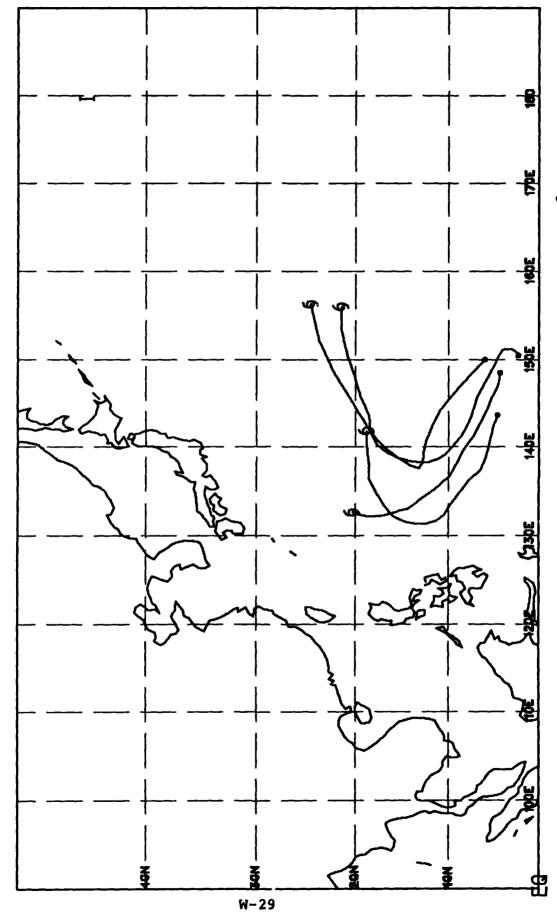
Actual path of straight tropical cyclones (> 33 kts) developing south of 15°N.



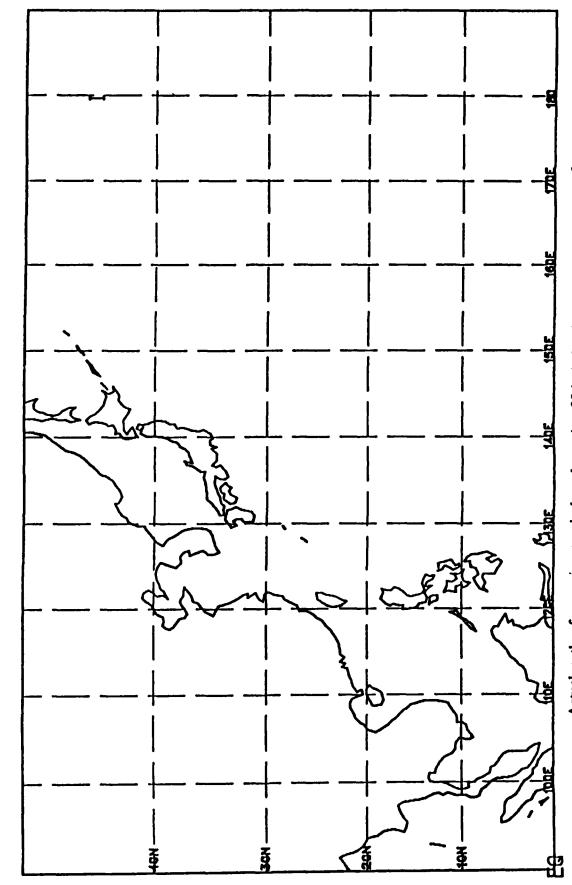
Actual path of straight tropical cyclones (> 33 kts) developing at or north of 15°N.



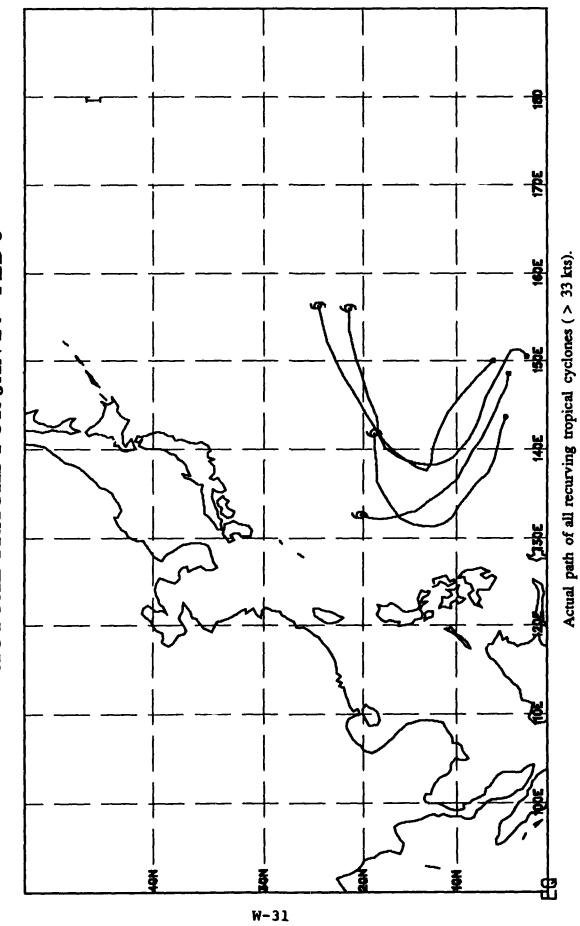
Actual path of all straight tropical cyclones (> 33 kts).

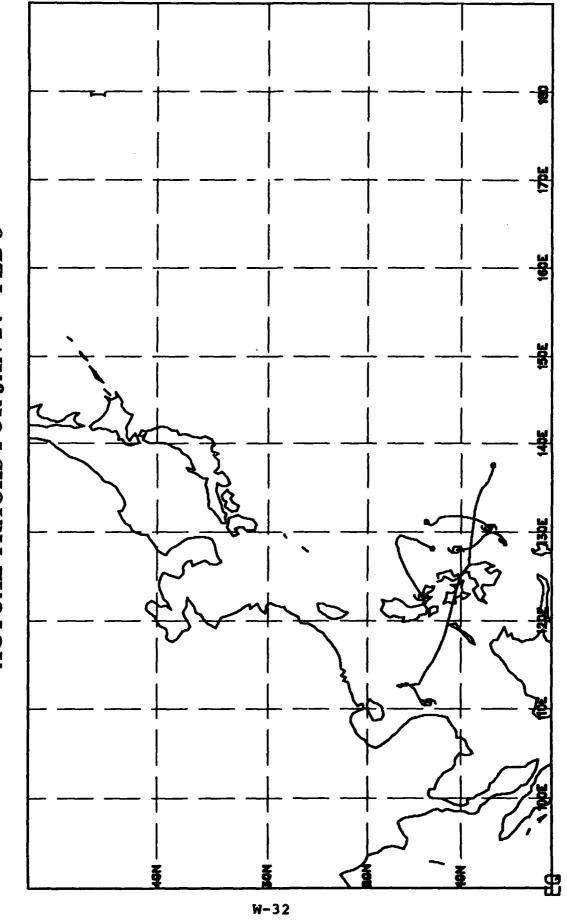


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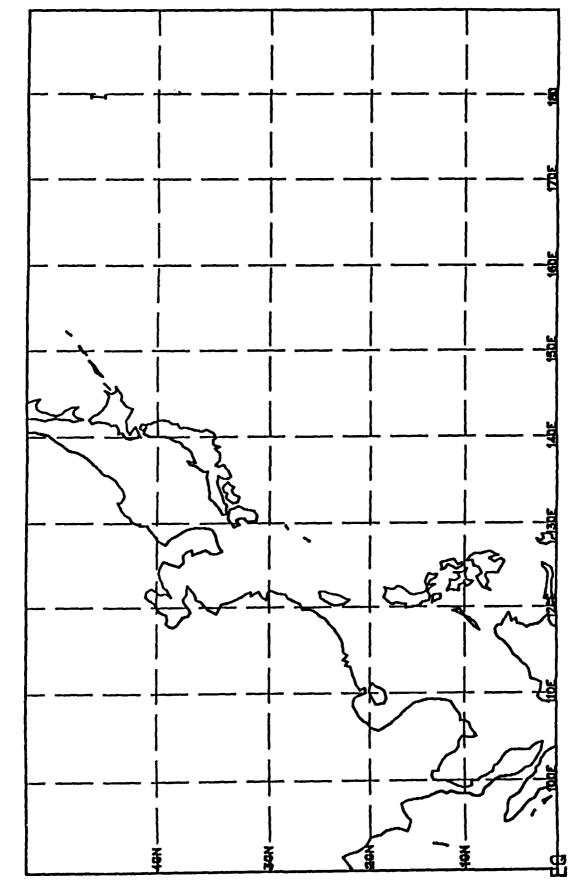


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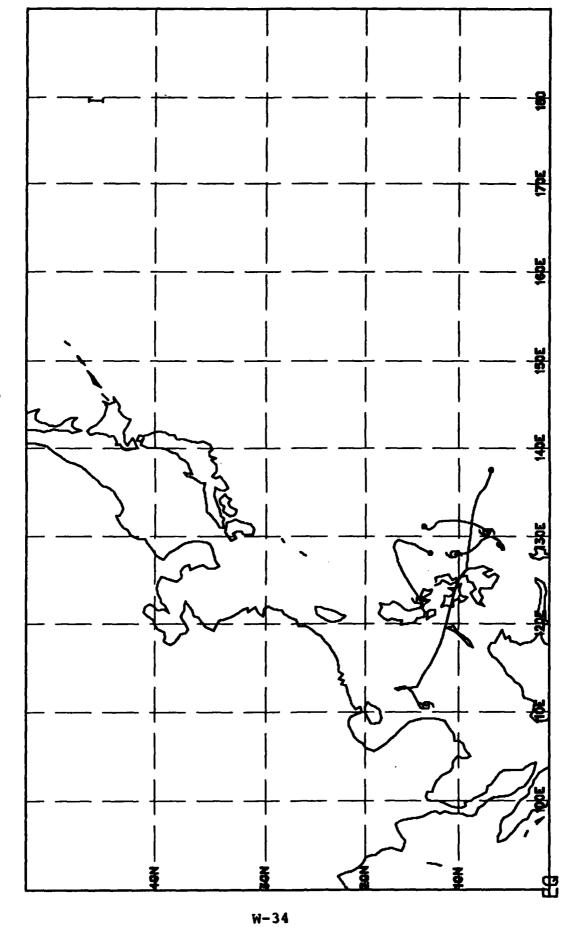




Actual path of other tropical cyclones (> 33 kts) developing south of 15°N.

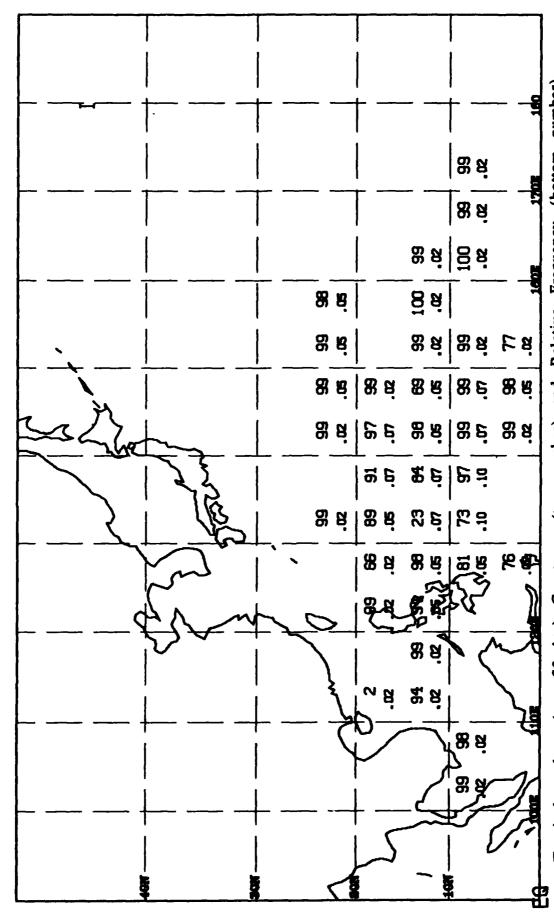


Actual path of other tropical cyclones (> 33 kts) developing at or north of 15°N.



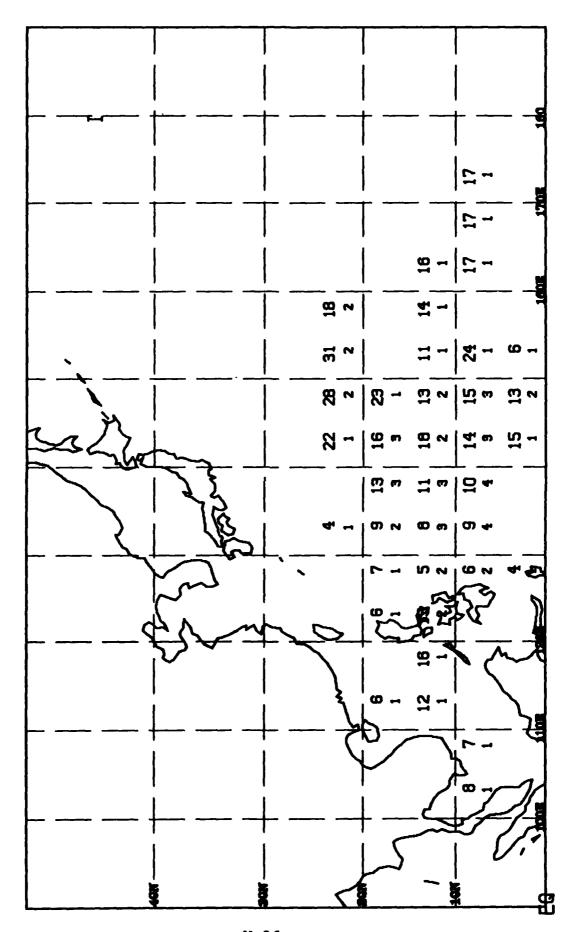
Actual path of all other tropical cyclones (> 33 kts).

CONSTANCY AND RELATIVE FREQUENCY FOR JAN 24 - FEB 8



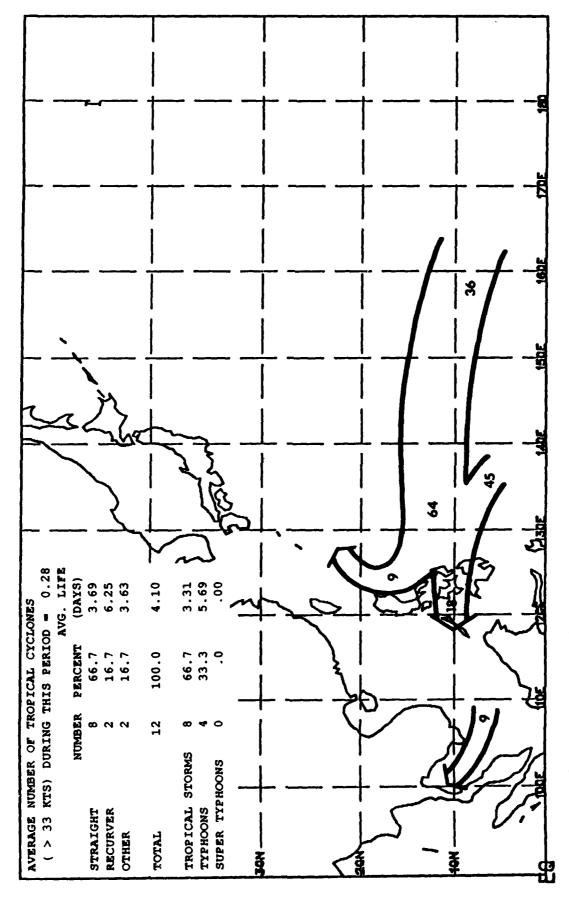
as the 12-hr average vector speed divided by the 12-hr average scalar speed. and Relative Frequency (bottom number) cyclones passing through the kts) Constancy (top number) tropical number of longitude square per year per time period. Frequency is the Constancy is defined Relative Frequency Tropical cyclone

SPEED OF MOVEMENT FOR JAN 24 - FEB 8

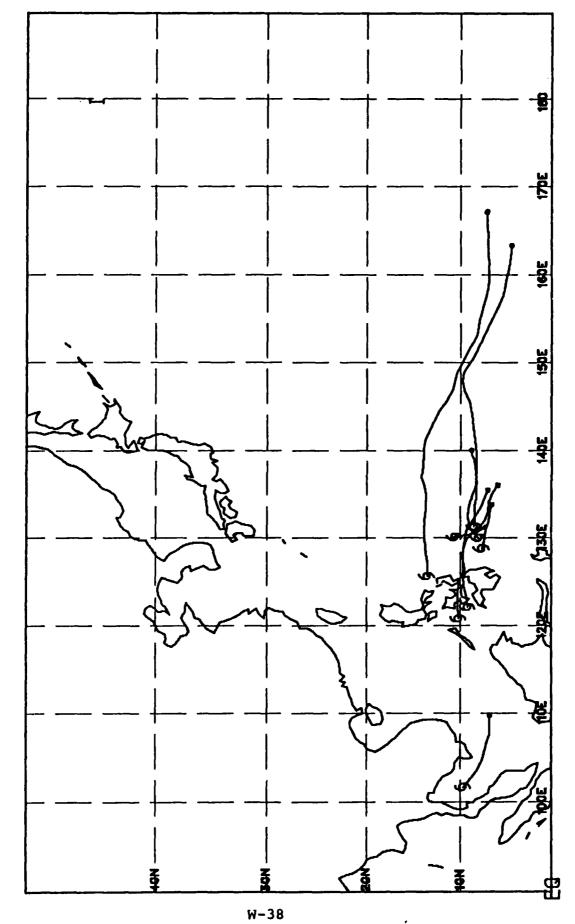


Average tropical cyclone (> 33 kts) Speed (top number) in knots and sample size (bottom number) for each 5° latitude by 5° longitude square. Contours are drawn only to those squares containing at least 5% of the sample.

MEAN PATHS FOR FEB 9 - FEB 23

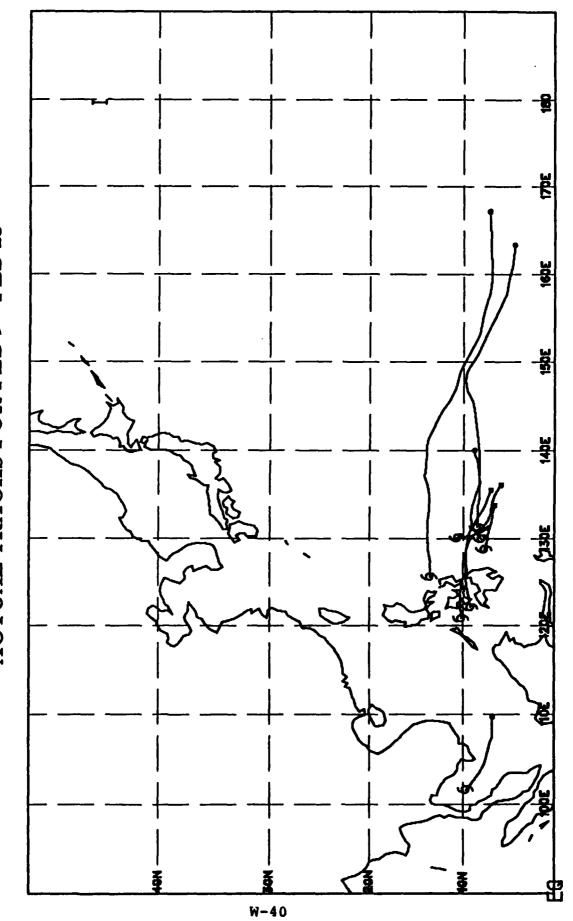


Numbers represent the percentage of tropical cyclones (> 33 kts) numbers may not add up to 100% since not all tropical cyclones develop/dissipate along a path. Tracks which contained less than the tropical cyclones (> 33 kts) are ignored. Mean tropical cyclone (> 33 kts) path. I which followed the indicated path. These (> 33 kts) follow a mean path and some 5% of the tropical cyclones (> 33 kts) a

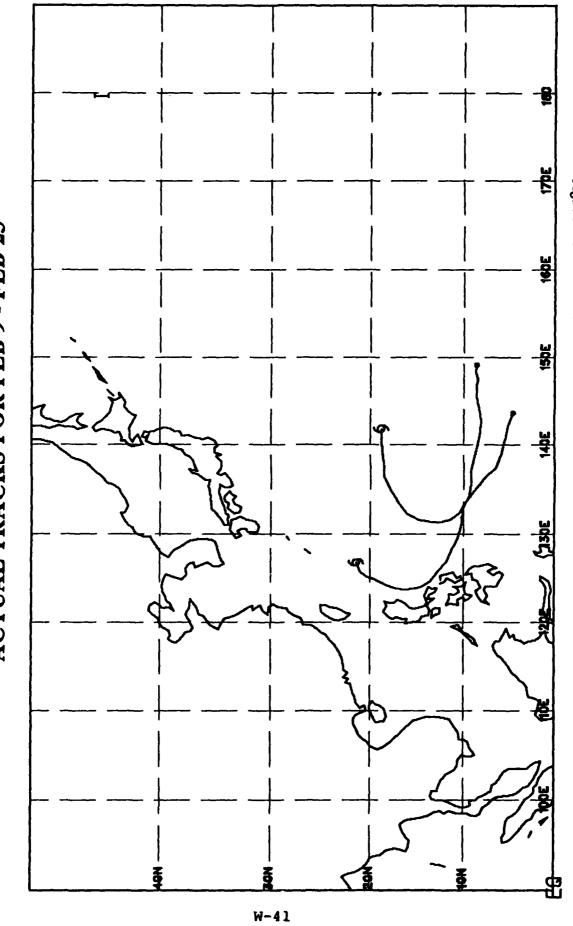


Actual path of straight tropical cyclones (> 33 kts) developing south of 15°N.

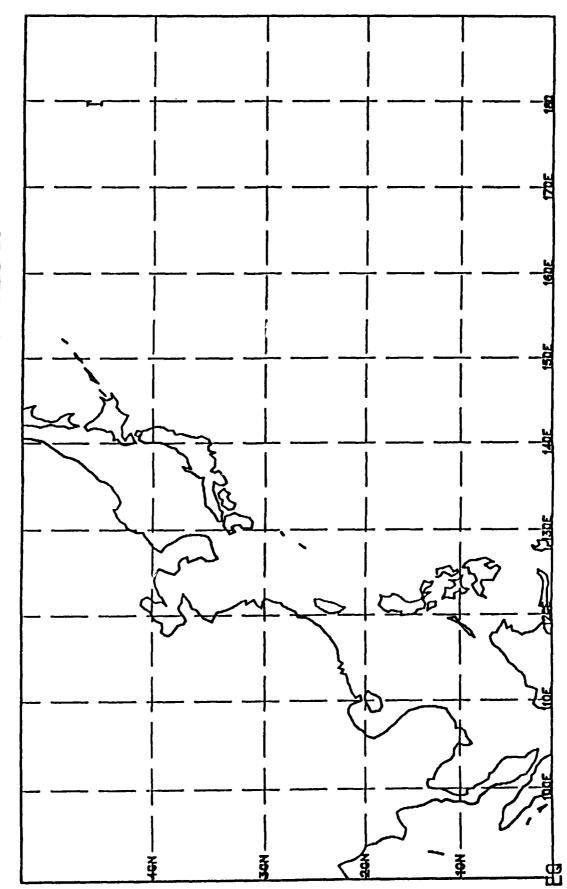
Actual path of straight tropical cyclones (> 33 kts) developing at or north of 15°N.



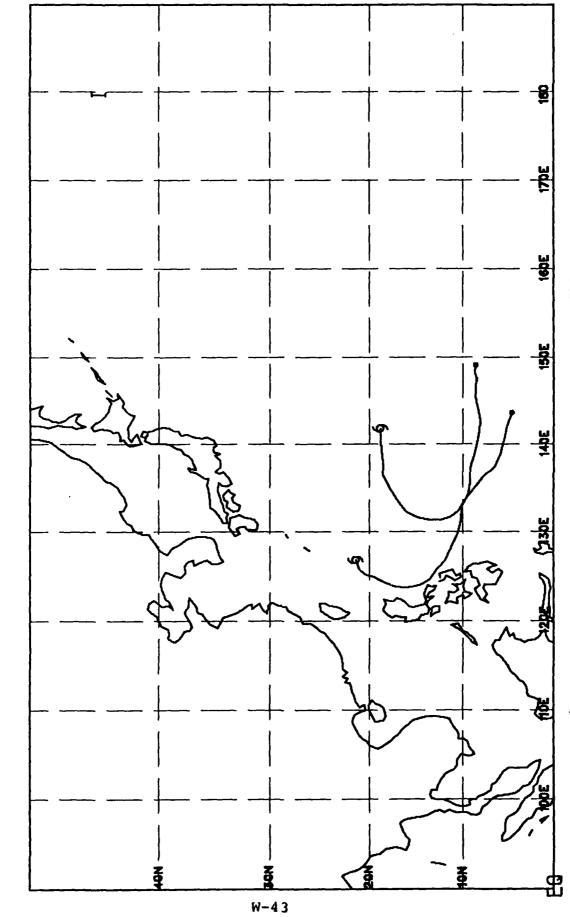
Actual path of all straight tropical cyclones (> 33 kts).



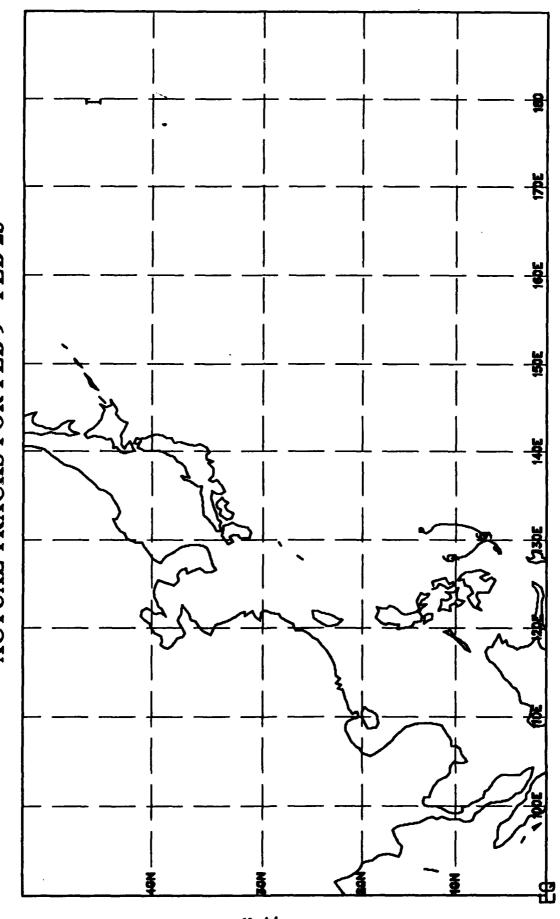
Actual path of recurving tropical cyclones (> 33 kts) developing south of 15°N.



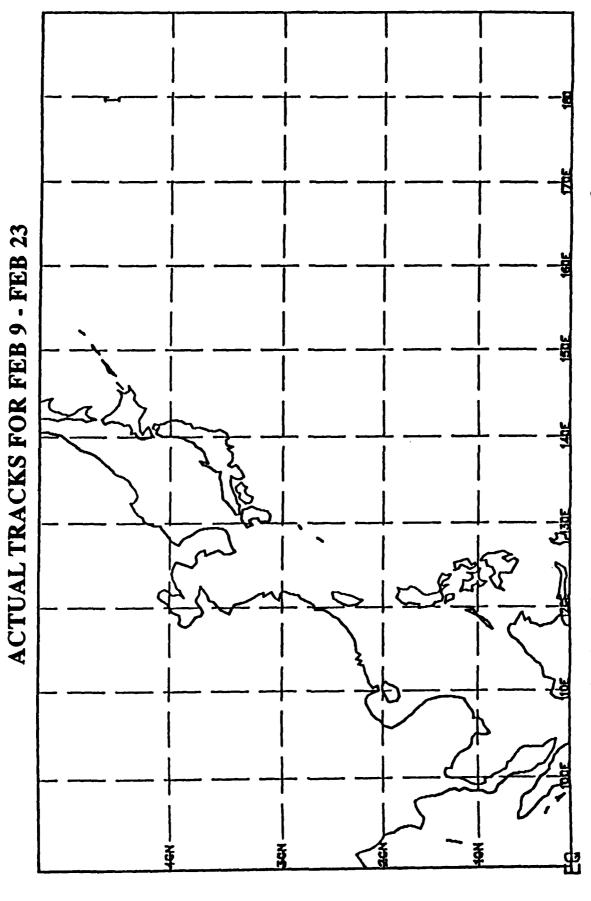
Actual path of recurving tropical cyclones (> 33 kts) developing at or north of 15°N.



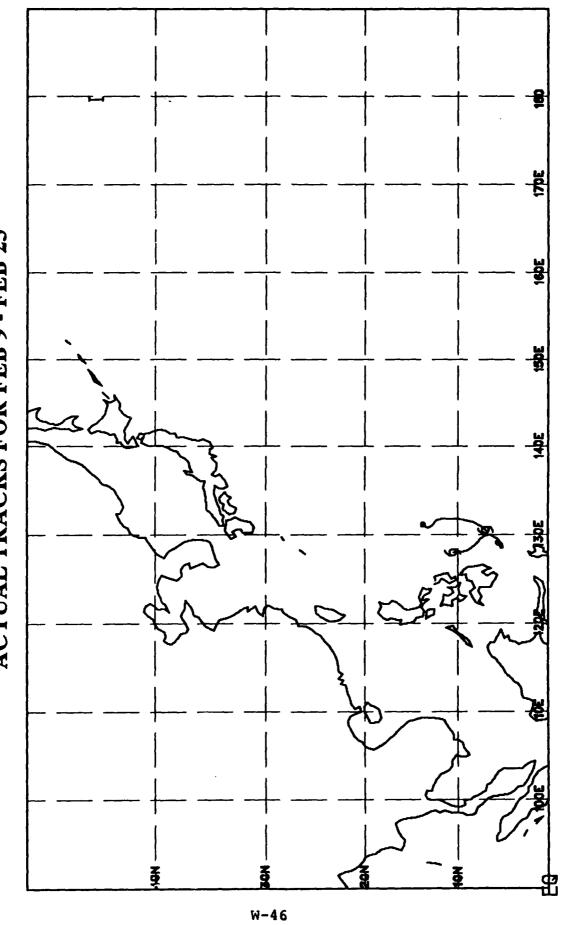
Actual path of all recurving tropical cyclones (> 33 kts).



Actual path of other tropical cyclones (>33 kts) developing south of 15°N.

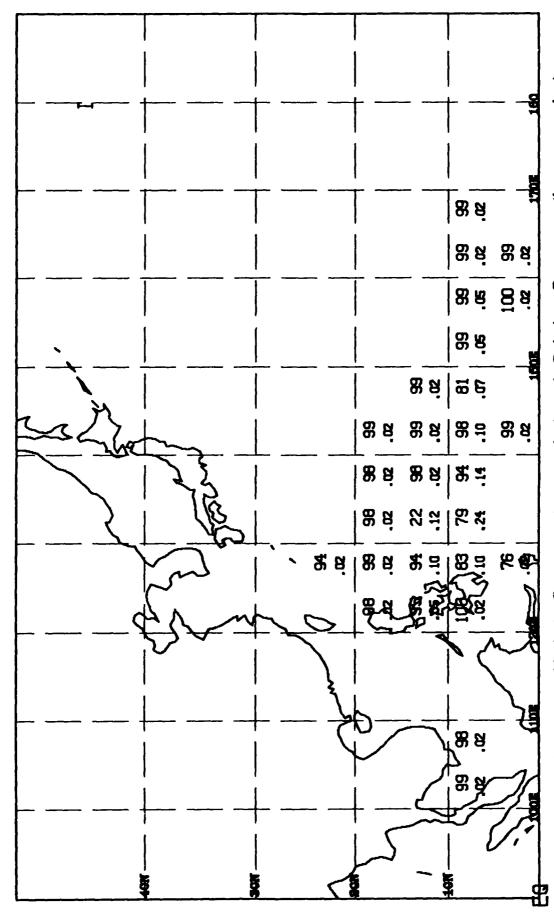


Actual path of other tropical cyclones (>33 kts) developing at or north of 150N.



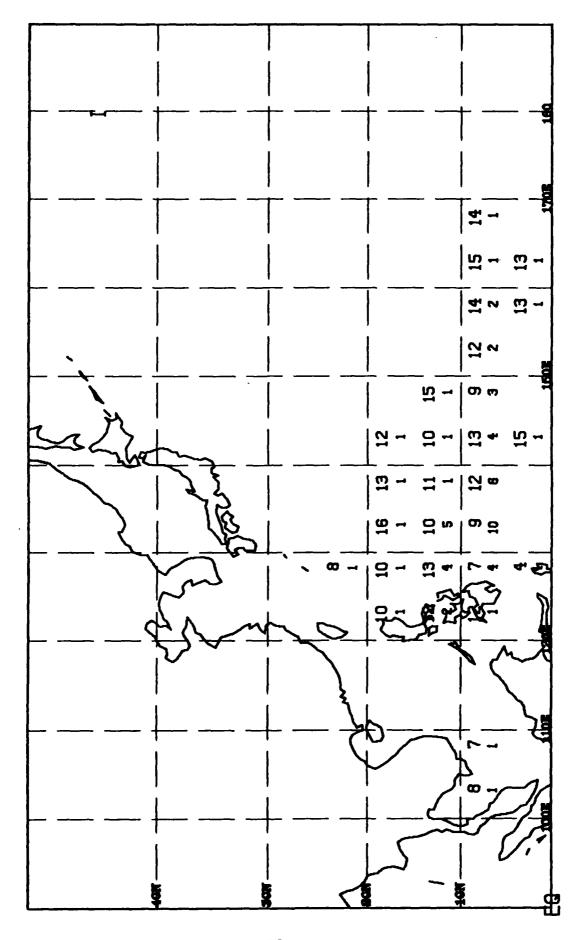
Actual path of all other tropical cyclones (> 33 kts).

CONSTANCY AND RELATIVE FREQUENCY FOR FEB 9 - FEB 23



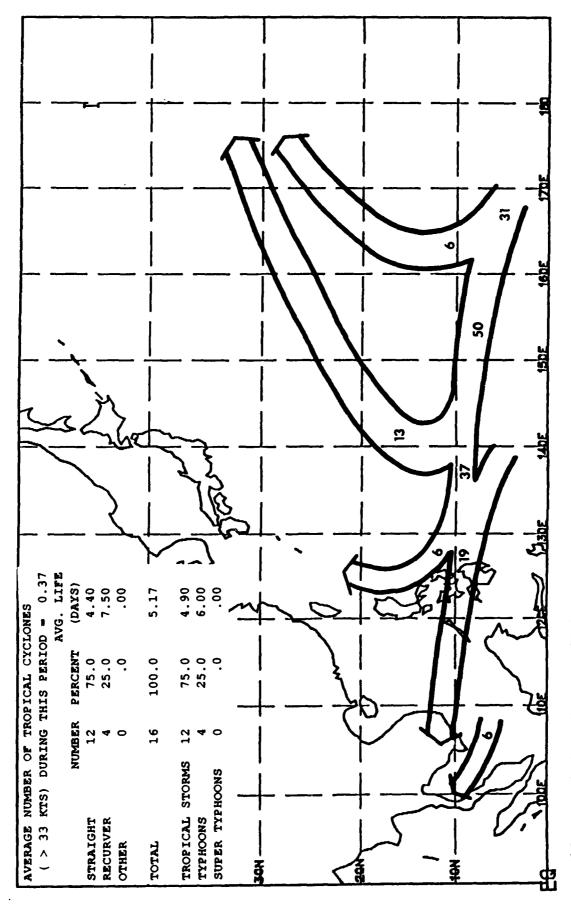
as the 12-hr average vector speed divided by the 12-hr average scalar speed. Relative Frequency (bottom number). cyclones passing through the and 33 kts) Constancy (top number) tropical number of longitude square per year per time period. is the Constancy is defined Relative Frequency cyclone Tropical

SPEED OF MOVEMENT FOR FEB 9 - FEB 23

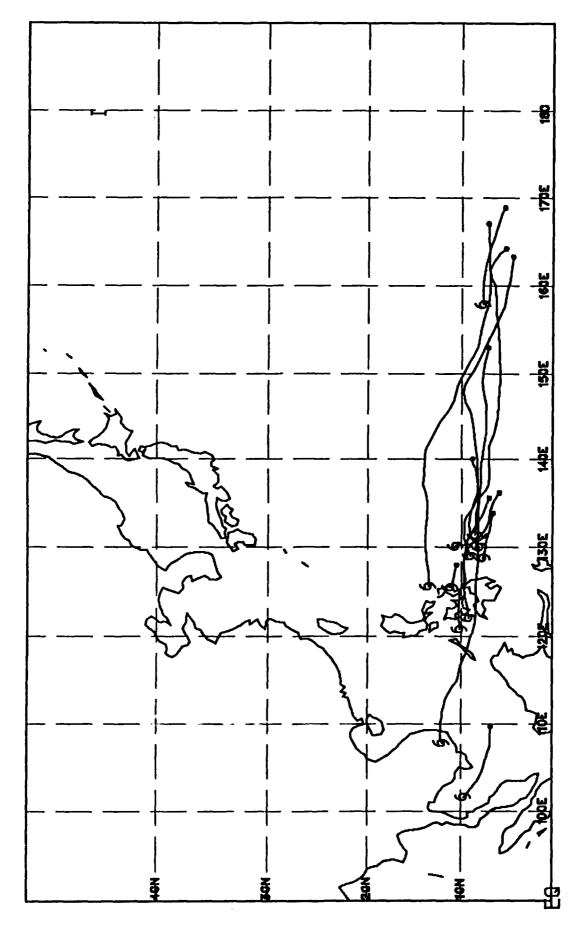


Average tropical cyclone (> 33 kts) Speed (top number) in knots and sample size (bottom number) for each 5° latitude by 5° longitude square. Contours are drawn only to those squares containing at least 5% of the sample.

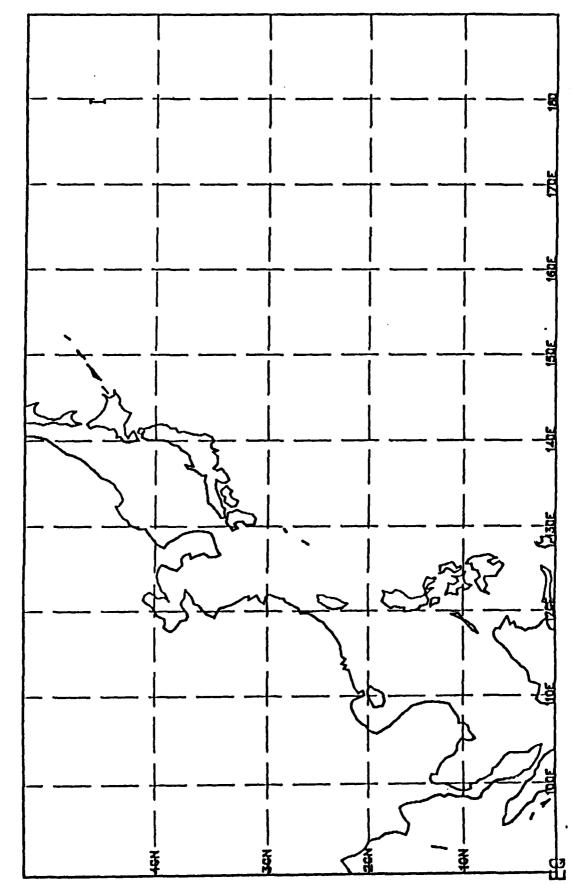
MEAN PATHS FOR FEB 24 - MAR 8



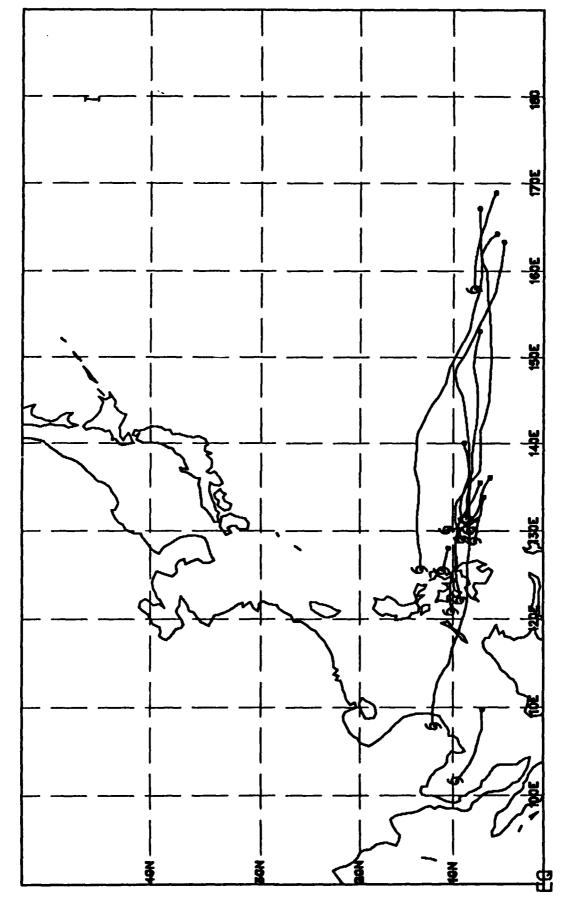
Numbers represent the percentage of tropical cyclones (> 33 kts) numbers may not add up to 100% since not all tropical cyclones develop/dissipate along a path. Tracks which contained less than the tropical cyclones (> 33 kts) are ignored. These (> 33 kts) follow a mean path and some Mean tropical cyclone (> 33 kts) path. which followed the indicated path. 5% of



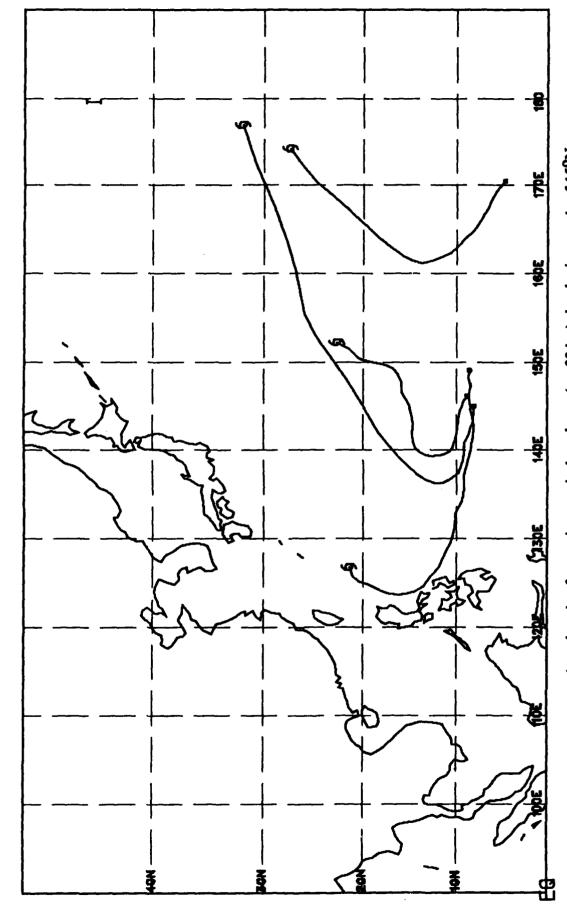
Actual path of straight tropical cyclones (> 33 kts) developing south of 15°N.



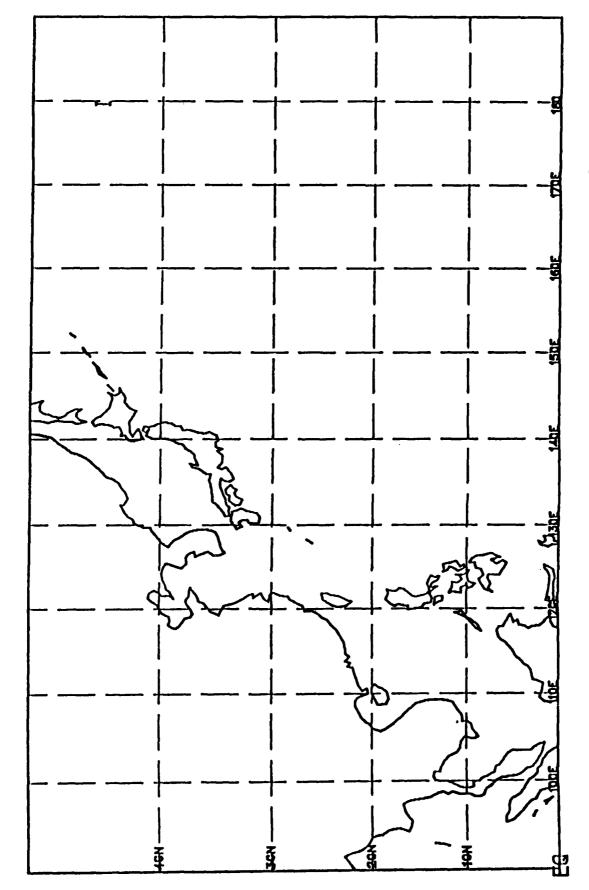
Actual path of straight tropical cyclones (> 33 kts) developing at or north of 15°N.



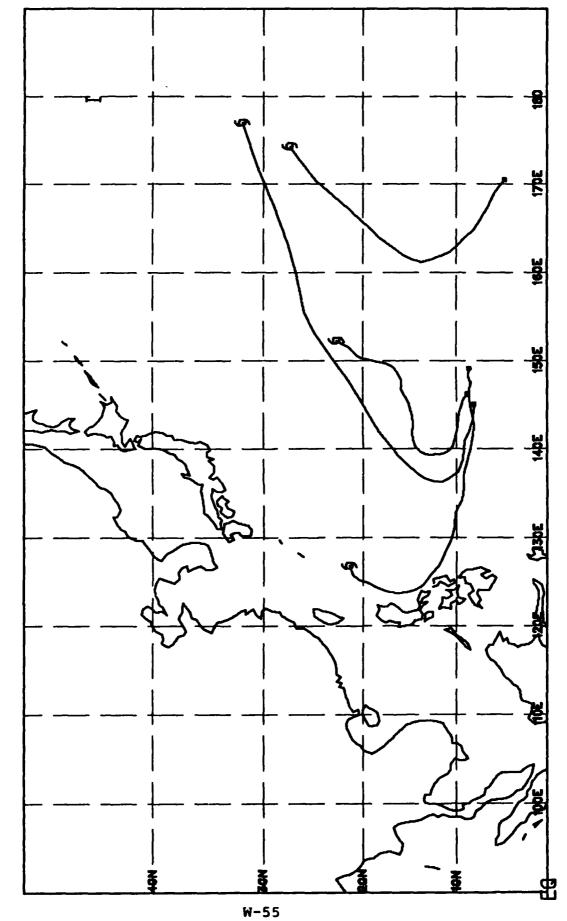
Actual path of all straight tropical cyclones (> 33 kts).



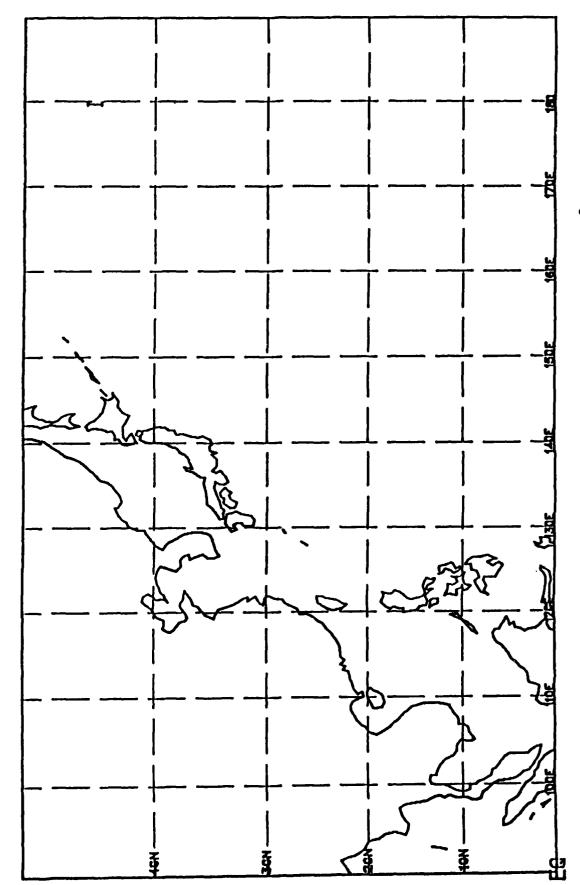
Actual path of recurving tropical cyclones (> 33 kts) developing south of 15°N.



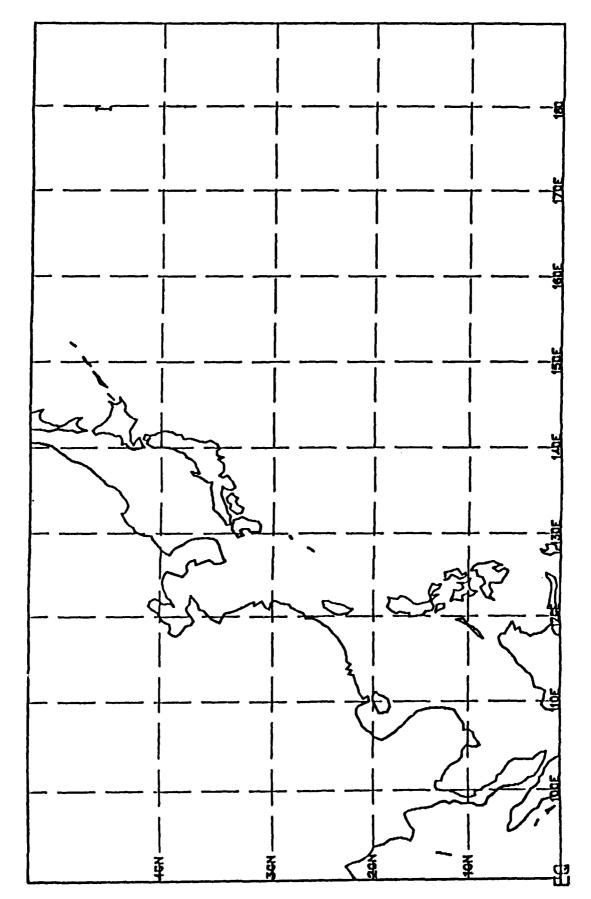
Actual path of recurving tropical cyclones (> 33 kts) developing at or north of 15°N.



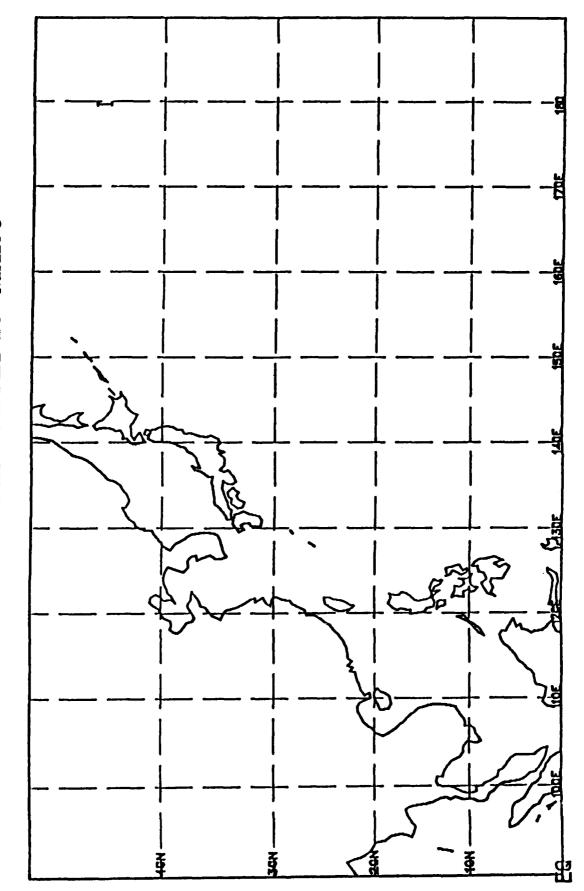
Actual path of all recurving tropical cyclones (> 33 kts).



Actual path of other tropical cyclones (>33 kts) developing south of 15°N.

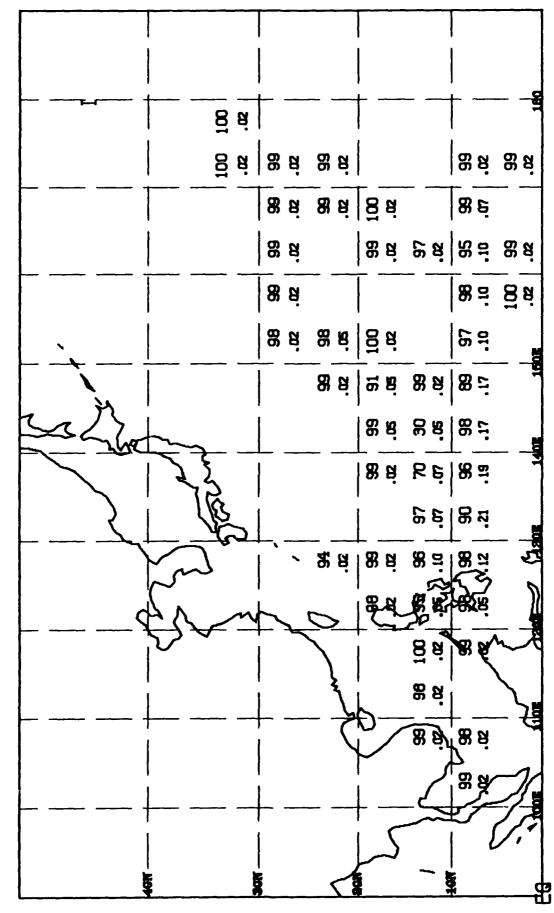


Actual path of other tropical cyclones (> 33 kts) developing at or north of 15°N.



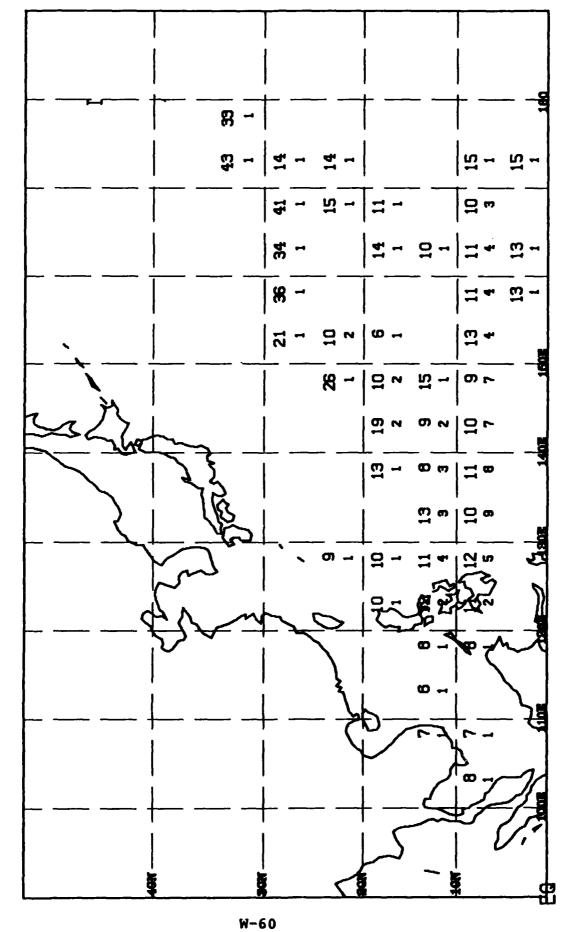
Actual path of all other tropical cyclones (>33 kts).

CONSTANCY AND RELATIVE FREQUENCY FOR FEB 24 - MAR 8



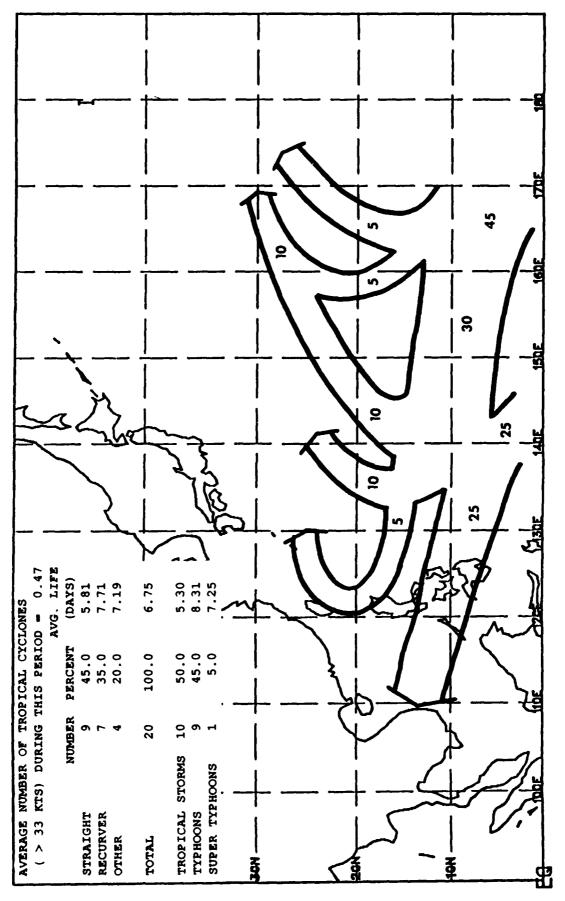
> 33 kts) Constancy (top number) and Relative Frequency (bottom number). as the 12-hr average vector speed divided by the 12-hr average scalar speed. is the number of tropical cyclones passing through the 5° latitude by 5°. Constancy is defined as the 12-hr ave Relative Frequency is the number of longitude square per year per time period. Tropical cyclone (

SPEED OF MOVEMENT FOR FEB 24 - MAR 8

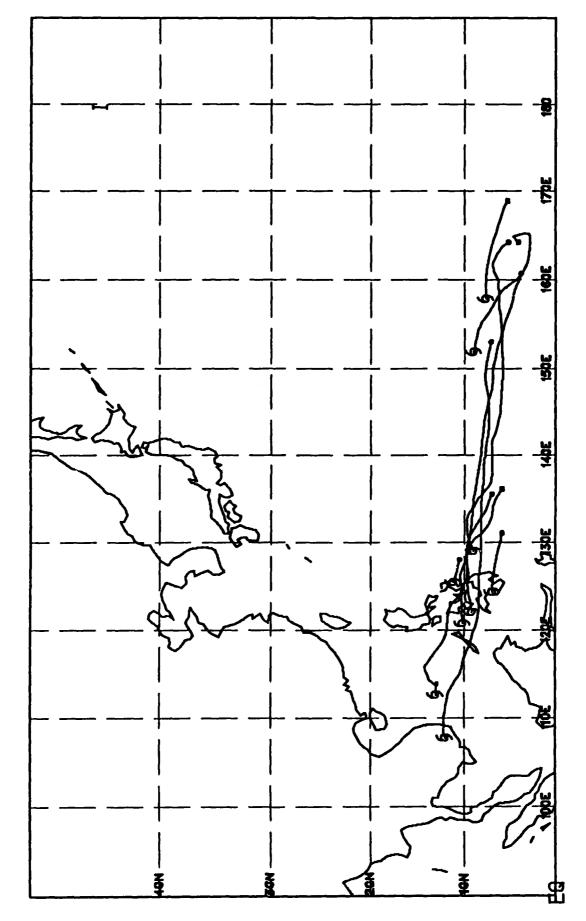


(> 33 kts) Speed (top number) in knots and sample size (bottom number) for longitude square. Contours are drawn only to those squares containing at Average tropical cyclone (each 5° latitude by 5° least 5% of the sample.

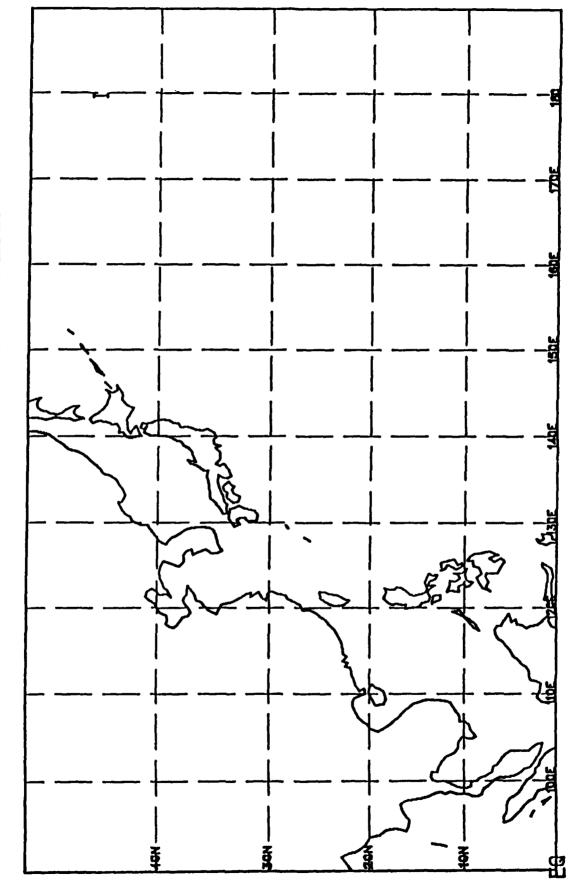
MEAN PATHS FOR MAR 9 - MAR 23



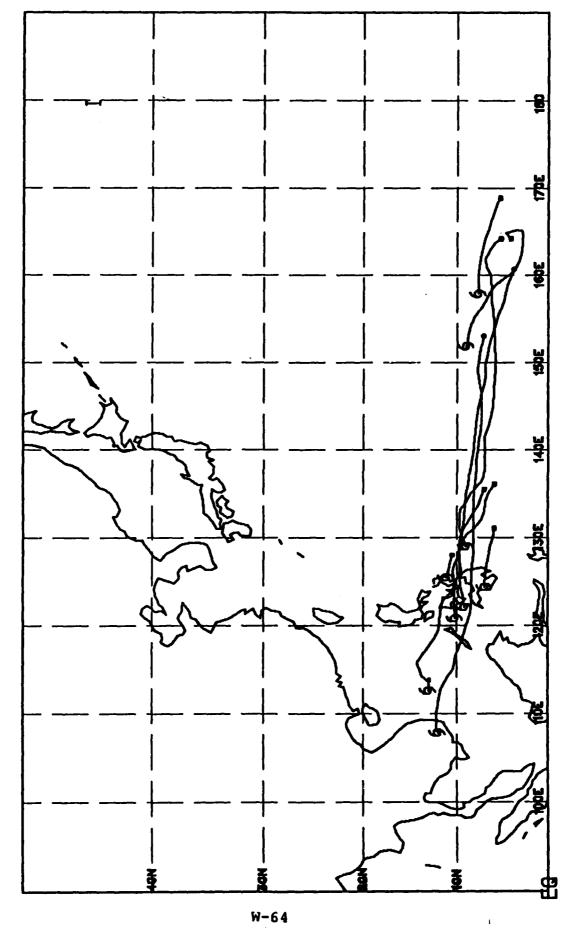
Numbers represent the percentage of tropical cyclones (> 33 kts) numbers may not add up to 100% since not all tropical cyclones Tracks which contained less than develop/dissipate along a path. the tropical cyclones (> 33 kts) are ignored. These which followed the indicated path. These (> 33 kts) follow a mean path and some Mean tropical cyclone (> 33 kts) path. 5% of



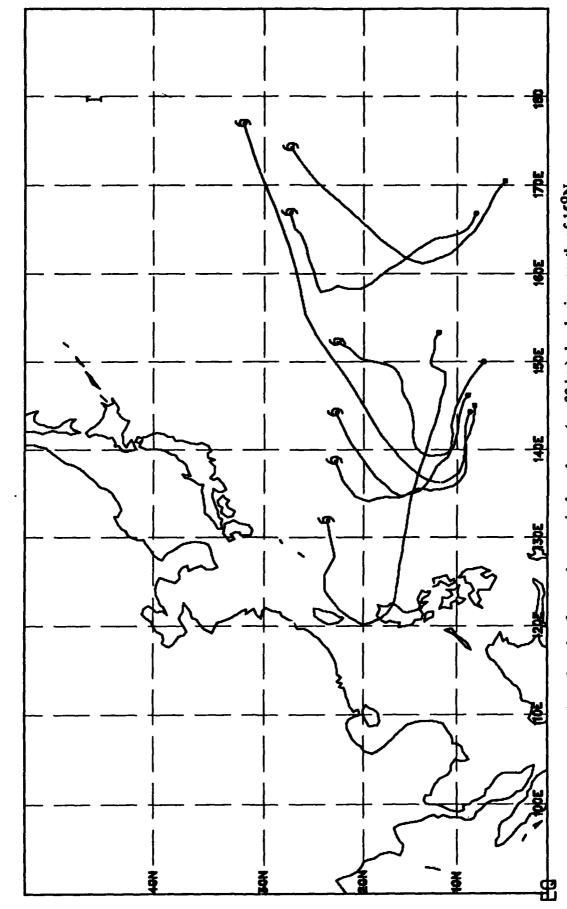
Actual path of straight tropical cyclones (> 33 kts) developing south of 15°N.



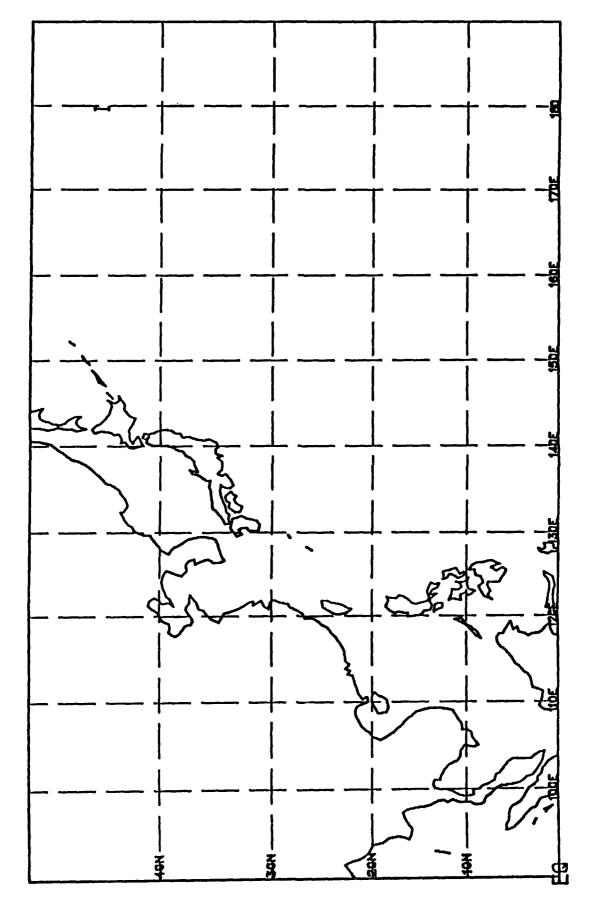
Actual path of straight tropical cyclones (> 33 kts) developing at or north of 15°N.



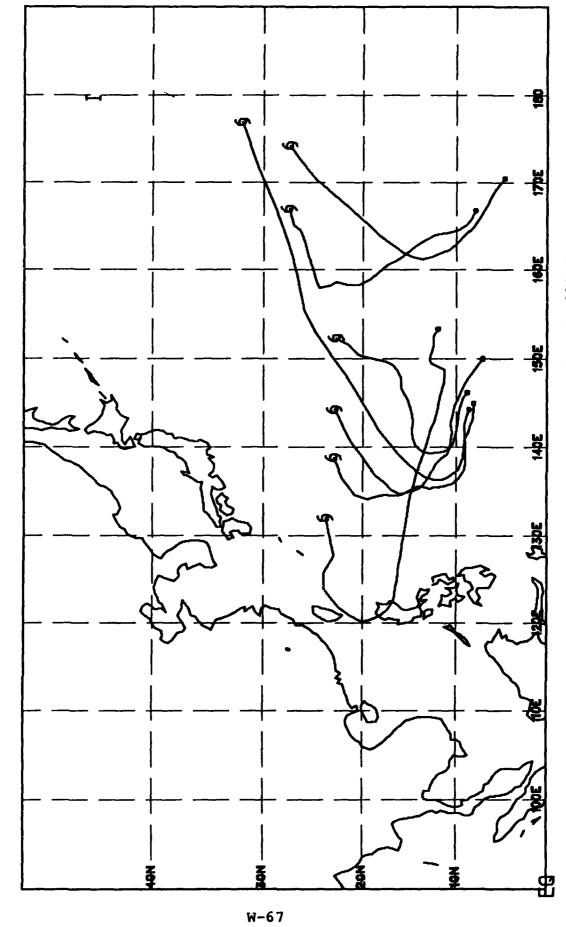
Actual path of all straight tropical cyclones (> 33 kts).



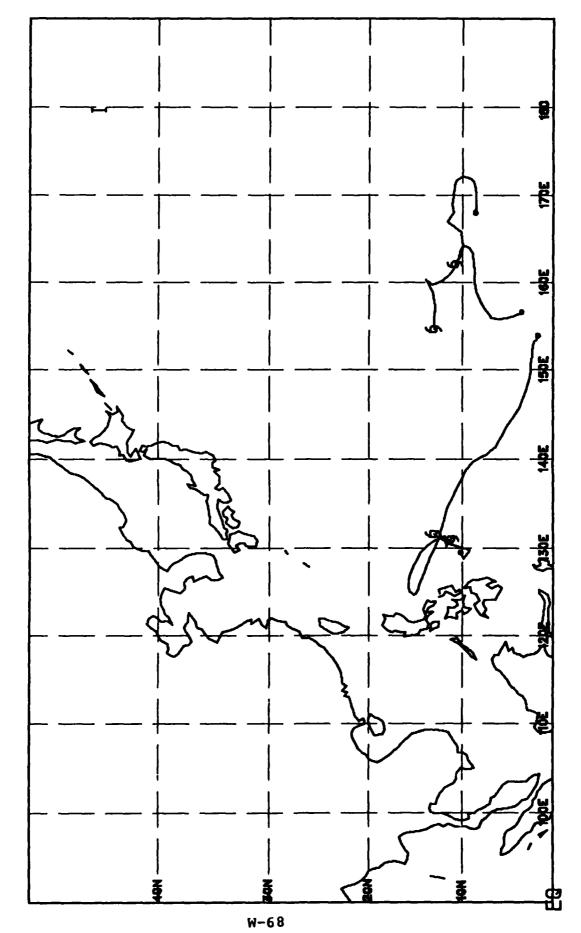
Actual path of recurving tropical cyclones (> 33 kts) developing south of 15°N.



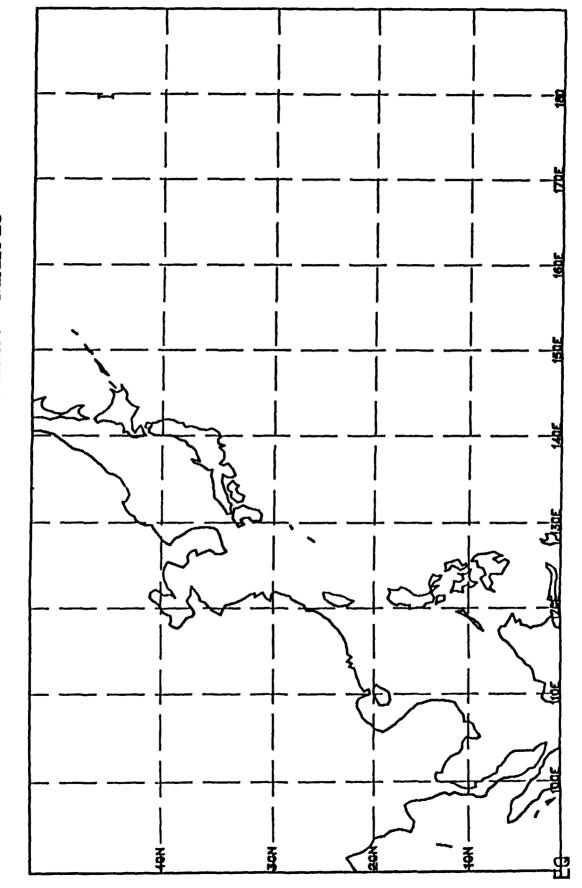
Actual path of recurving tropical cyclones (> 33 kts) developing at or north of 15°N.



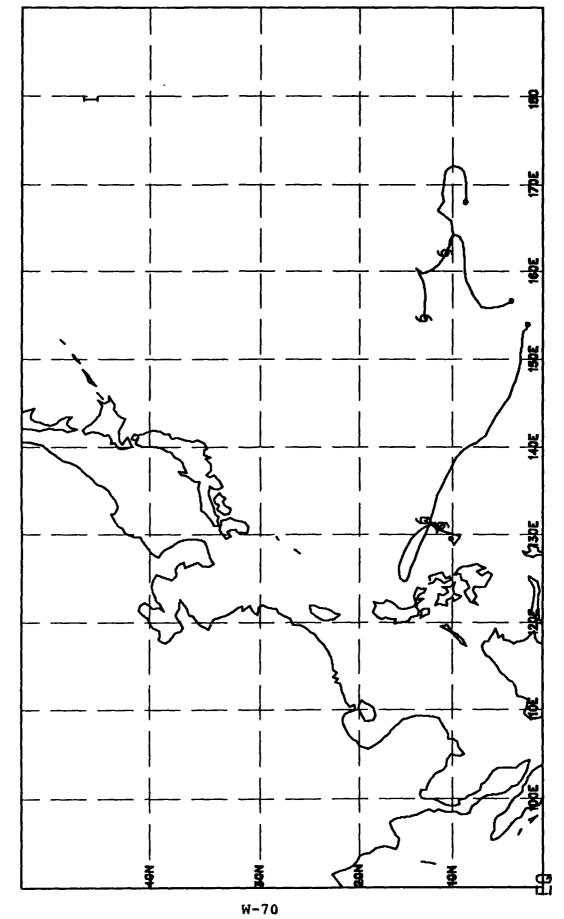
Actual path of all recurving tropical cyclones (> 33 kts).



Actual path of other tropical cyclones (> 33 kts) developing south of 150N.

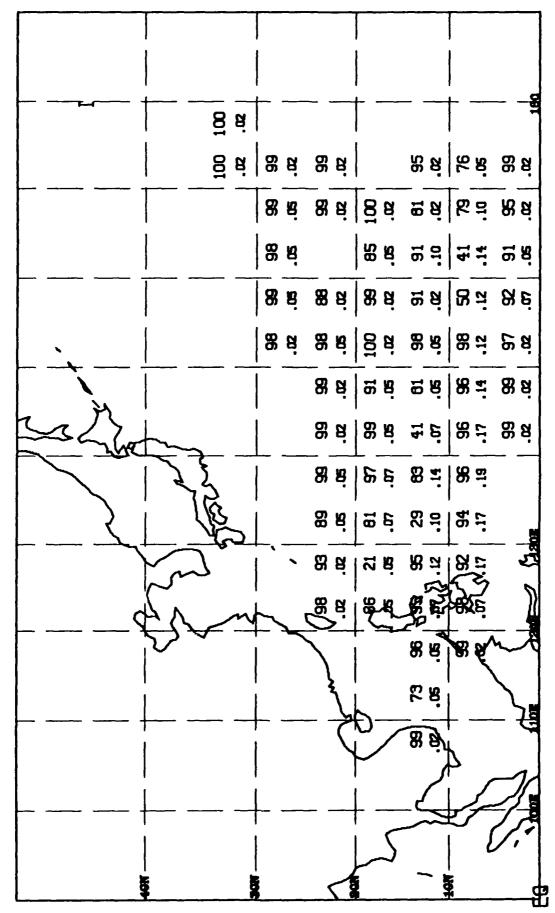


Actual path of other tropical cyclones (> 33 kts) developing at or north of 15°N.



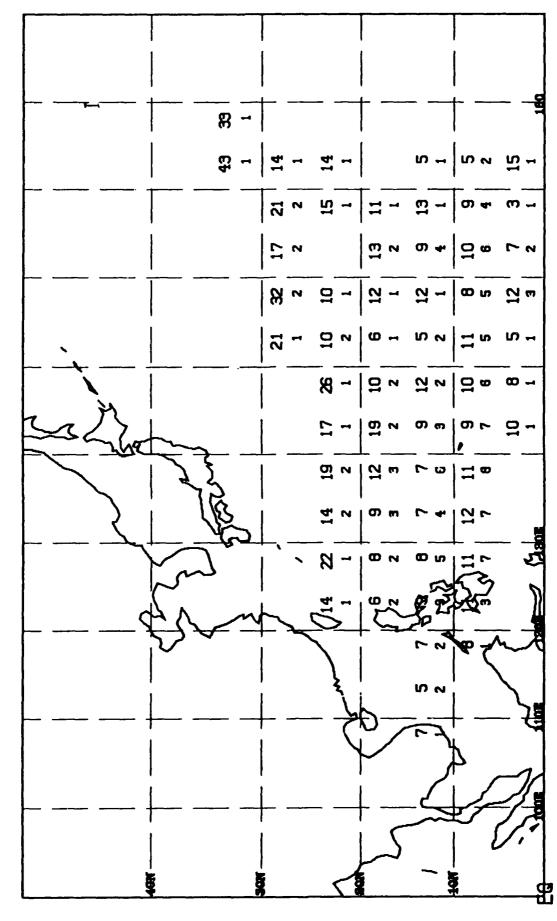
Actual path of all other tropical cyclones (>33 kts).

CONSTANCY AND RELATIVE FREQUENCY FOR MAR 9 - MAR 23



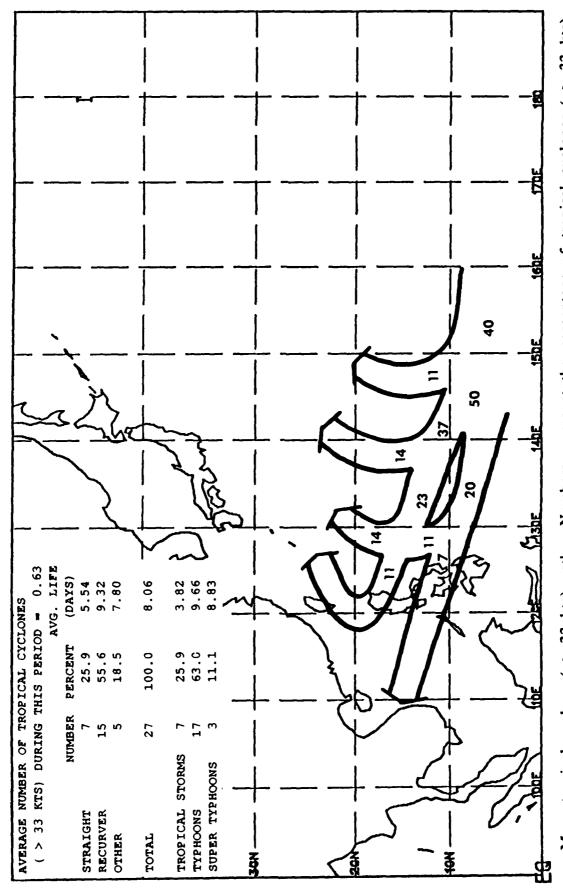
as the 12-hr average vector speed divided by the 12-hr average scalar speed. and Relative Frequency (bottom number) cyclones passing through the number) 33 kts) Constancy (top Relative Frequency 13 une numerical longitude square per year per time period. Constancy is defined cyclone (Tropical

SPEED OF MOVEMENT FOR MAR 9 - MAR 23

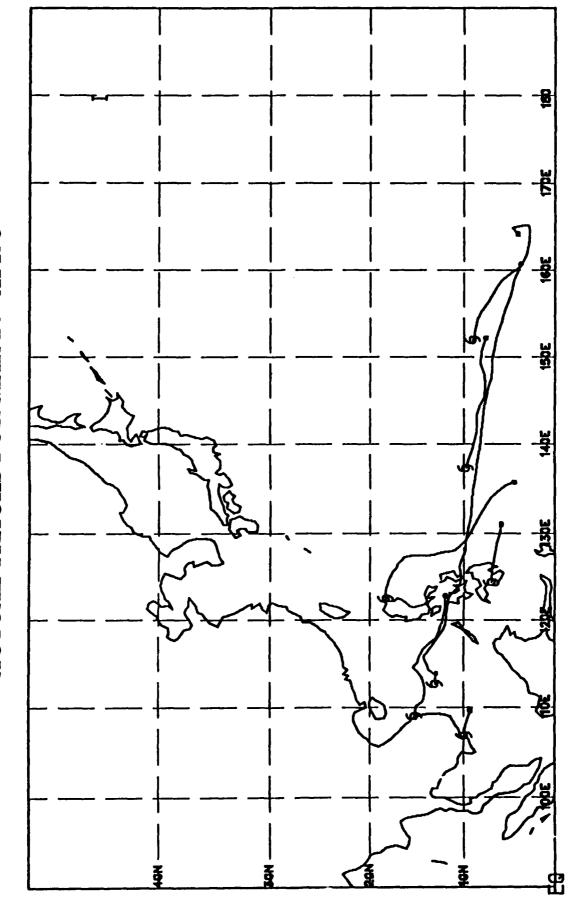


(> 33 kts) Speed (top number) in knots and sample size (bottom number) for longitude squares. Contours are drawn only to those squares containing at Average tropical cyclone (> 33 kts) Speed each 5° latitude by 5° longitude square. least 5% of the sample.

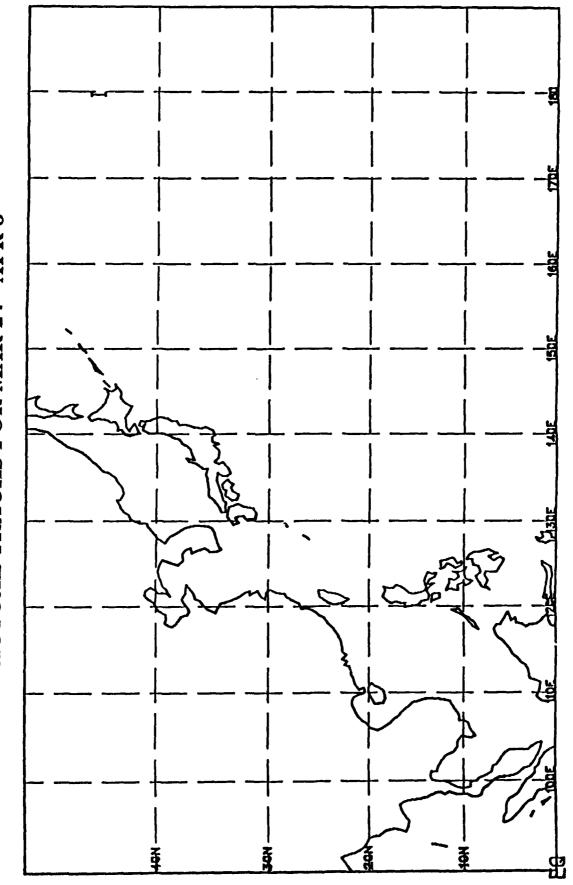
MEAN PATHS FOR MAR 24 - APR 8



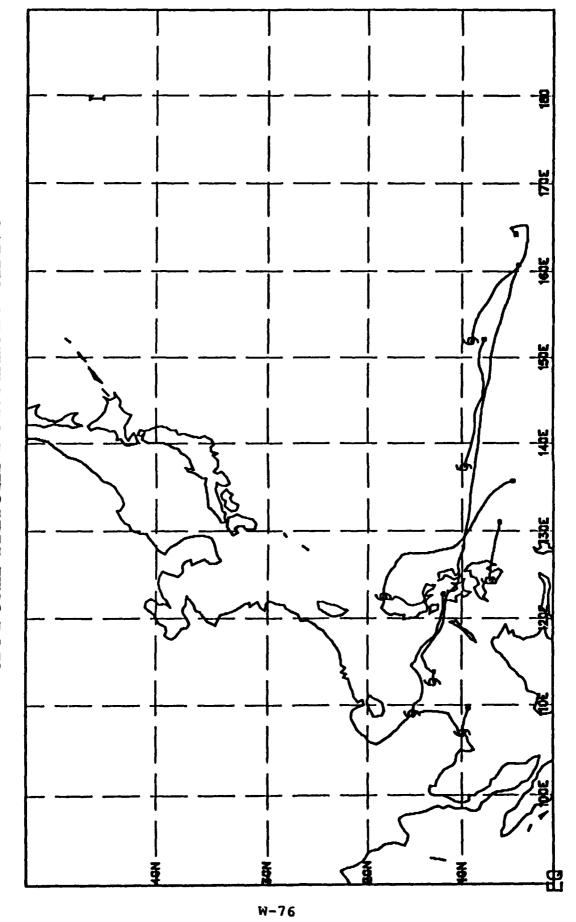
Numbers represent the percentage of tropical cyclones (> 33 kts) numbers may not add up to 100% since not all tropical cyclones develop/dissipate along a path. Tracks which contained less than 5% of the tropical cyclones (> 33 kts) are ignored. Mean tropical cyclone (> 33 kts) path. which followed the indicated path. These > 33 kts) follow a mean path and some



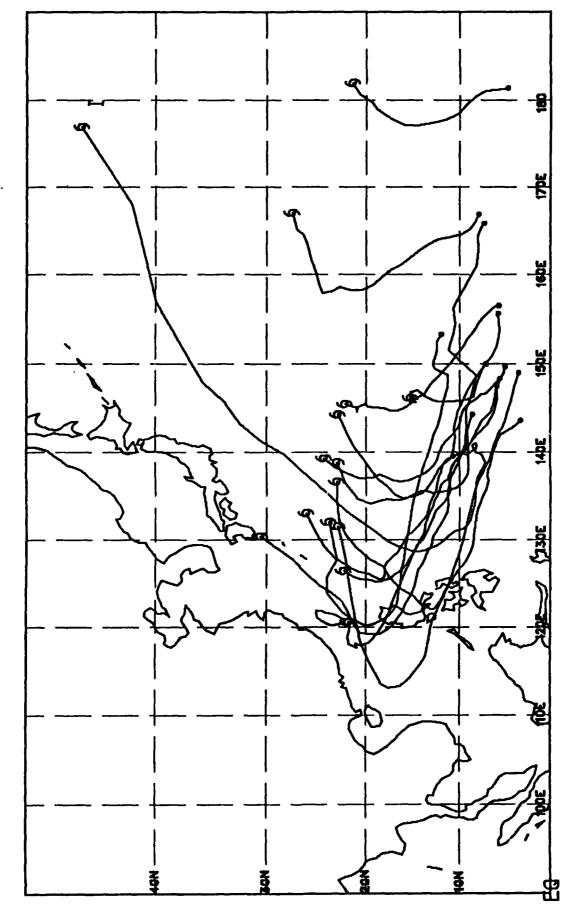
Actual path of straight tropical cyclones (> 33 kts) developing south of 15°N.



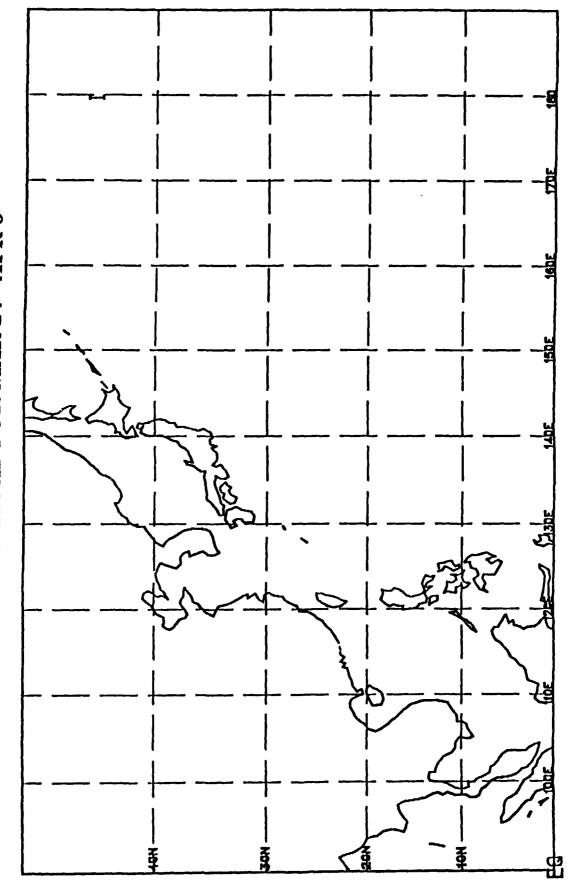
Actual path of straight tropical cyclones (> 33 kts) developing at or north of 15°N.



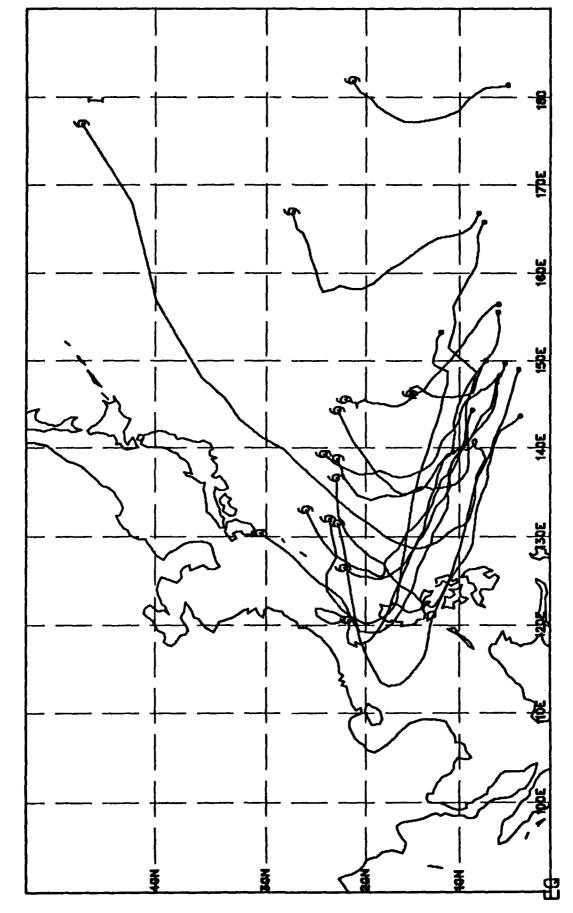
Actual path of all straight tropical cyclones (> 33 kts).



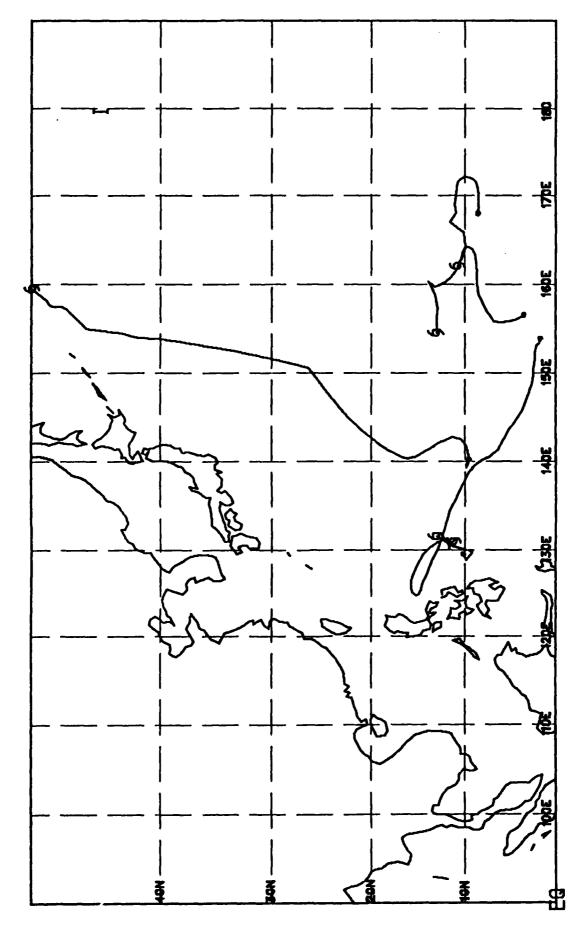
Actual path of recurving tropical cyclones (> 33 kts) developing south of 15°N.



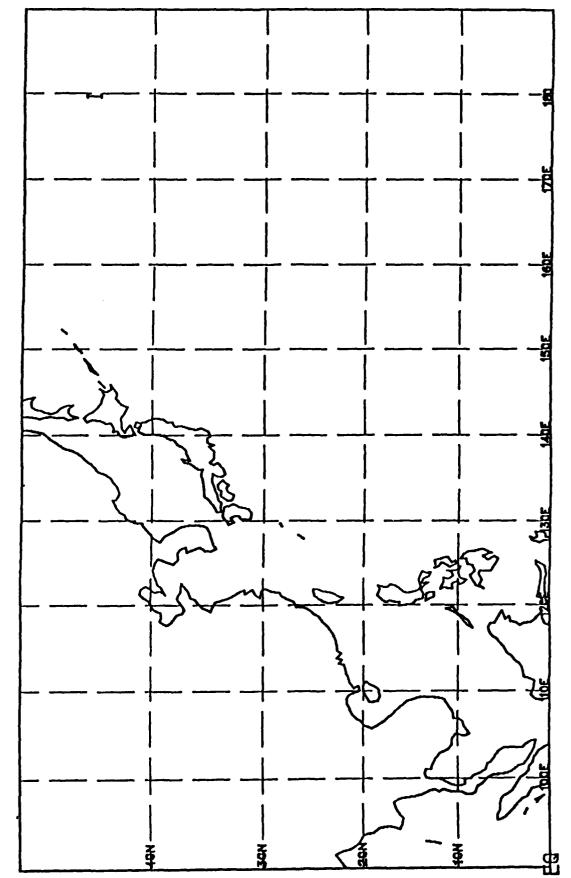
Actual path of recurving tropical cyclones (> 33 kts) developing at or north of 15°N.



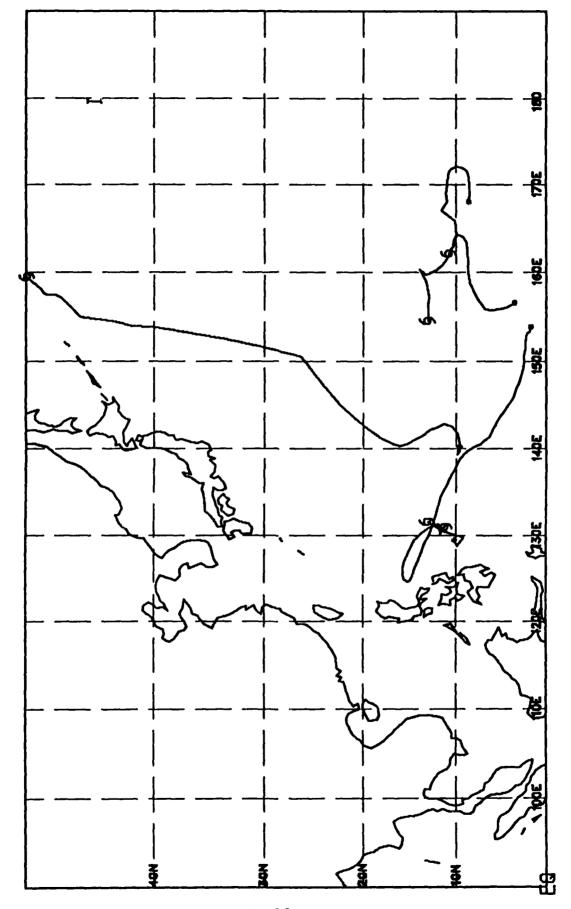
Actual path of all recurving tropical cyclones (> 33 kts).



Actual path of other tropical cyclones (>33 kts) developing south of 15°N.



Actual path of other tropical cyclones (> 33 kts) developing at or north of 150N.



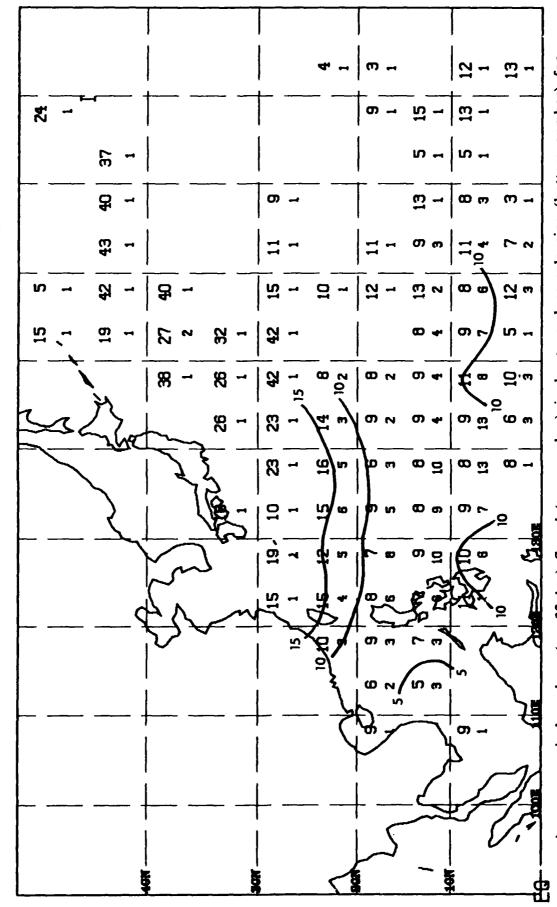
Actual path of all other tropical cyclones (>33 kts).

CONSTANCY AND RELATIVE FREQUENCY FOR MAR 24 - APR 8

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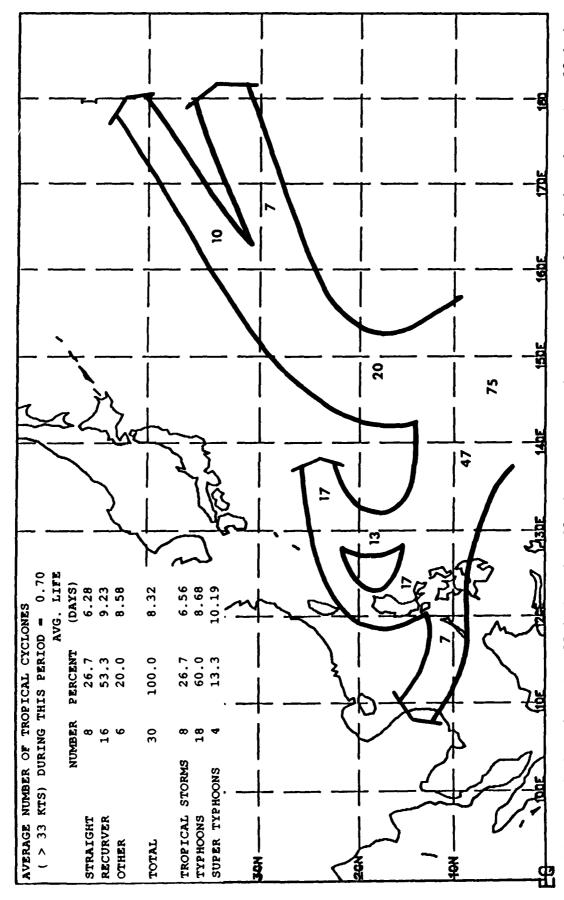
Tropical cyclone (> 33 kts) Constancy (top number) and Relative Frequency (bottom number). Constancy is defined as the 12-hr average vector speed divided by the 12-hr average scalar speed. Relative Frequency is the number of tropical cyclones passing through the 50 latitude by 50 longitude square per year per time period.

SPEED OF MOVEMENT FOR MAR 24 - APR 8

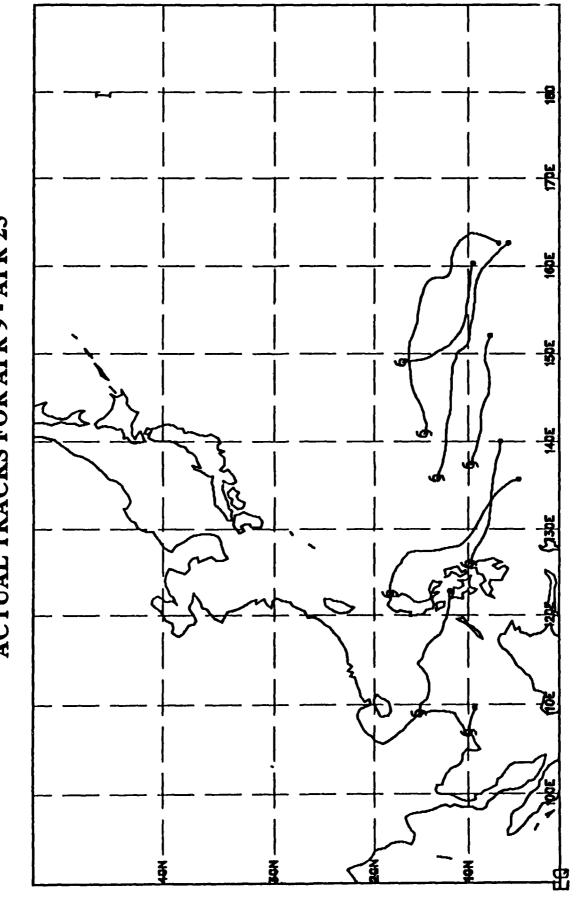


(> 33 kts) Speed (top number) in knots and sample size (bottom number) for longitude square. Contours are drawn only to those squares containing at Average tropical cyclone each 50 latitude by 50 least 5% of the sample.

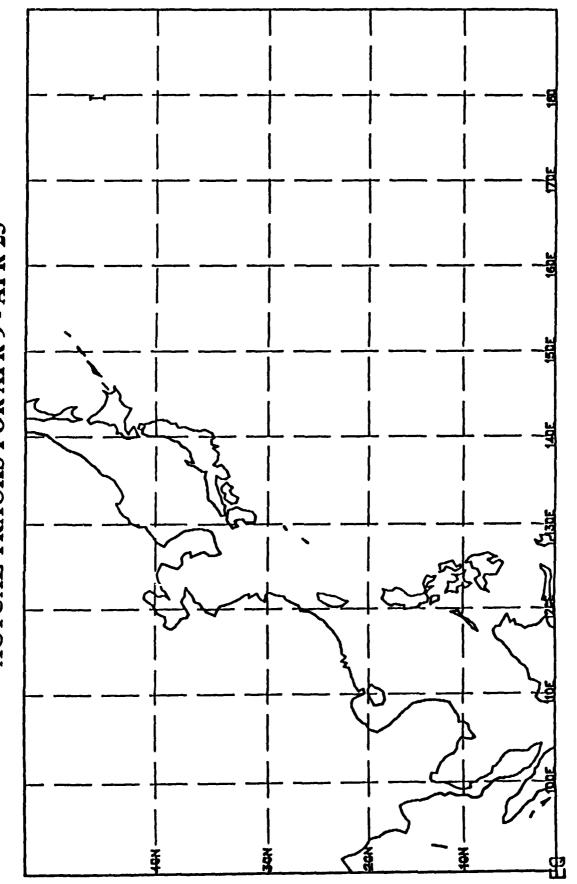
MEAN PATHS FOR APR 9 - APR 23



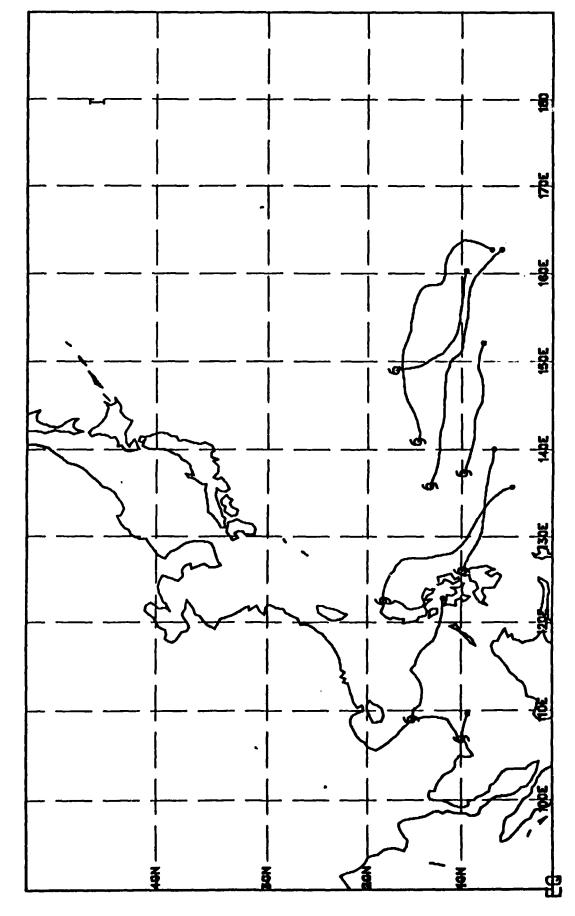
Numbers represent the percentage of tropical cyclones (> 33 kts) numbers may not add up to 100% since not all tropical cyclones develop/dissipate along a path. Tracks which contained less than 5% of the tropical cyclones (> 33 kts) are ignored. These (> 33 kts) follow a mean path and some Mean tropical cyclone (> 33 kts) path. which followed the indicated path.



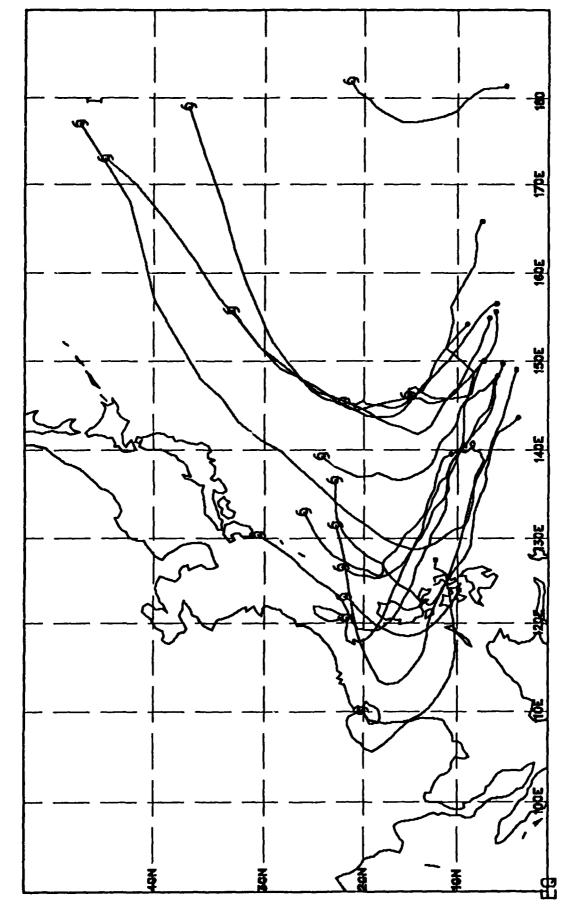
Actual path of straight tropical cyclones (> 33 kts) developing south of 15°N.



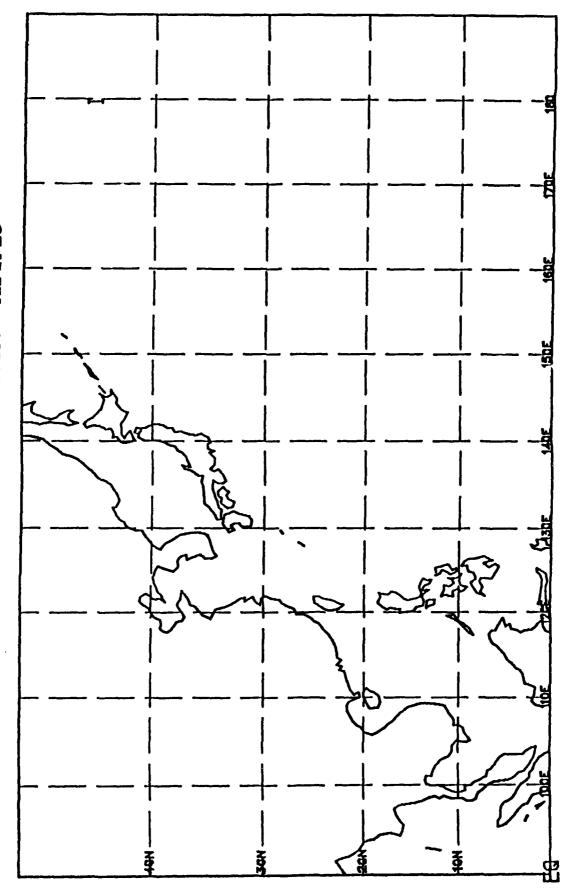
Actual path of straight tropical cyclones (> 33 kts) developing at or north of 15°N.



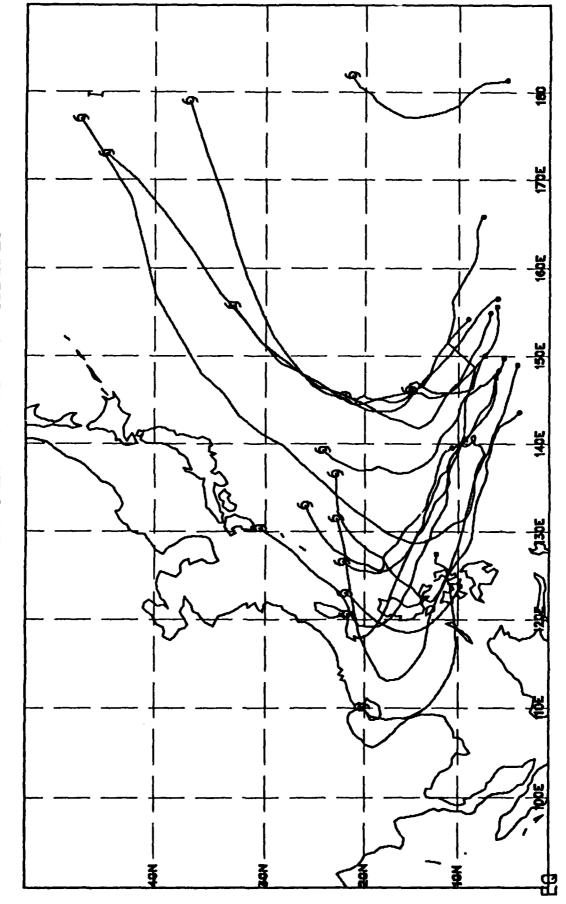
Actual path of all straight tropical cyclones (> 33 kts).



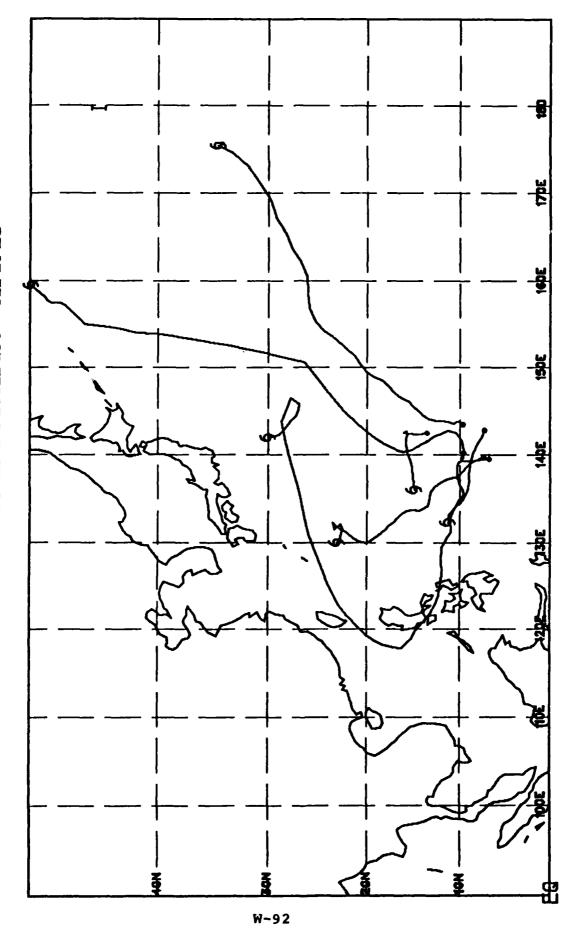
Actual path of recurving tropical cyclones (> 33 kts) developing south of 15°N.



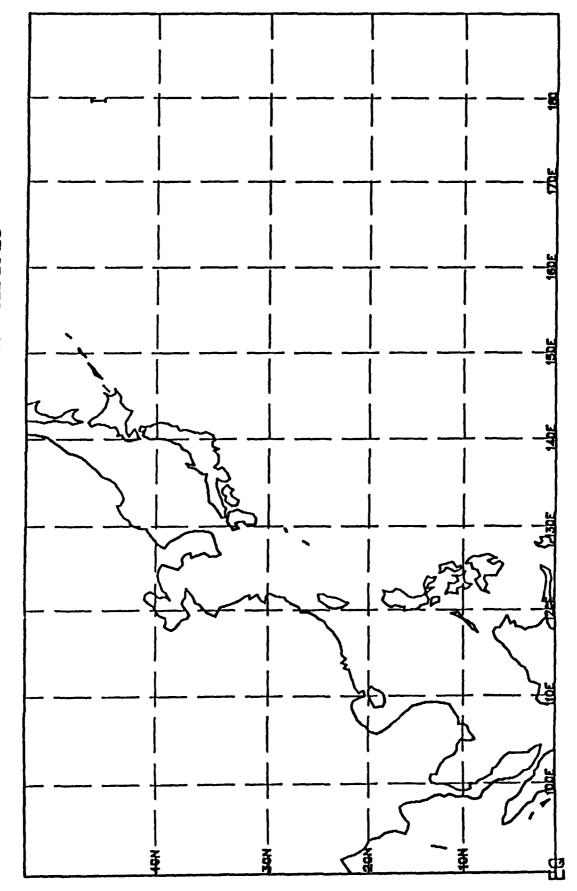
Actual path of recurving tropical cyclones (> 33 kts) developing at or north of 15°N.



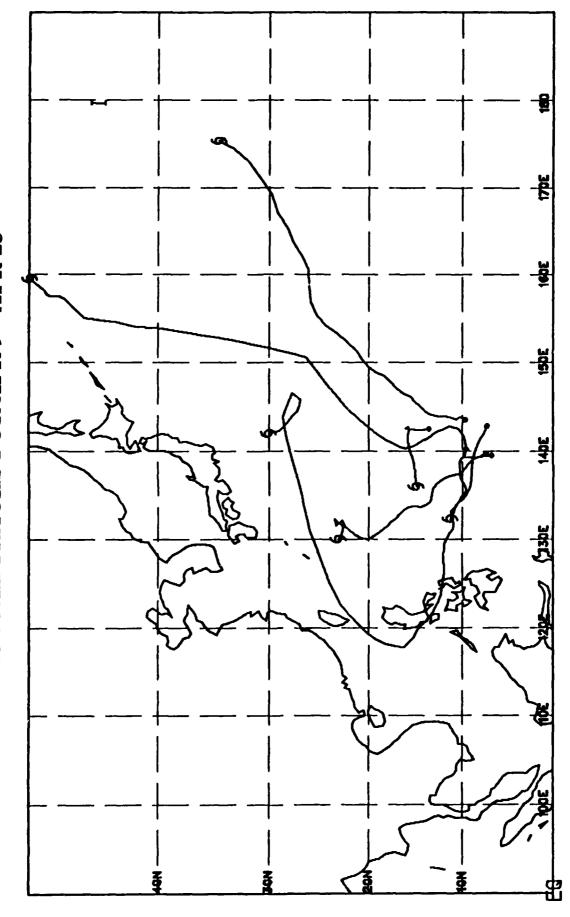
Actual path of all recurving tropical cyclones (> 33 kts).



Actual path of other tropical cyclones (>33 kts) developing south of 15°N.



Actual path of other tropical cyclones (> 33 kts) developing at or north of 15°N.



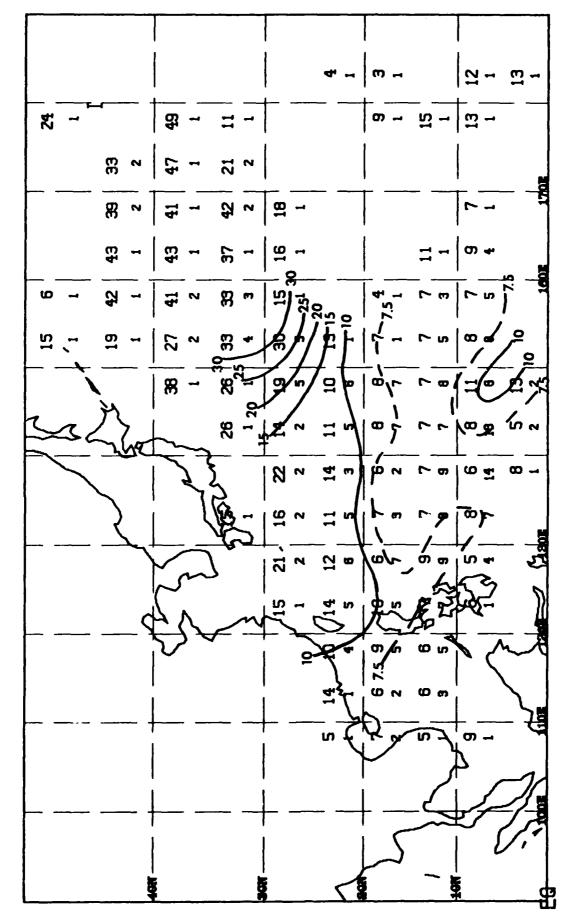
Actual path of all other tropical cyclones (> 33 kts).

CONSTANCY AND RELATIVE FREQUENCY FOR APR 9 - APR 23

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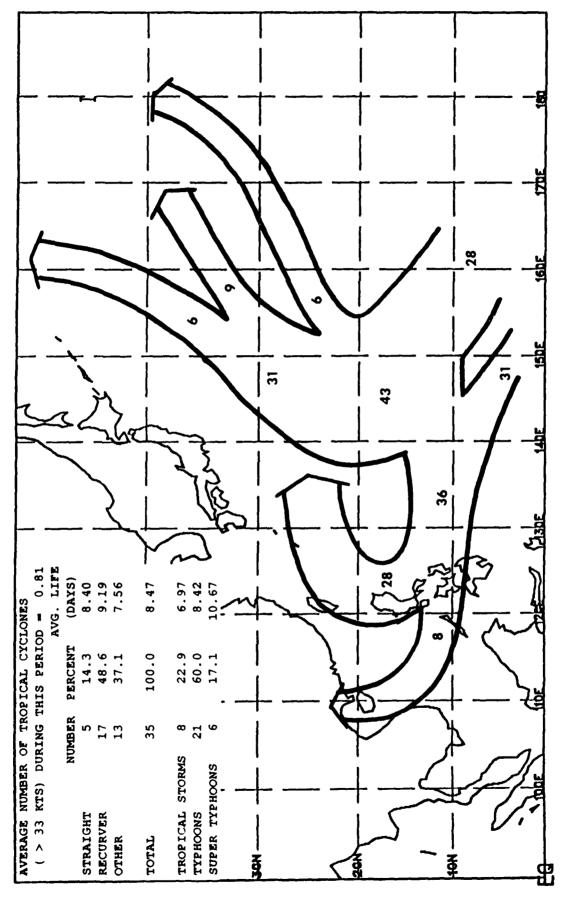
Tropical cyclone (> 33 kts) Constancy (top number) and Relative Frequency (bottom number). Constancy is defined as the 12-hr average vector speed divided by the 12-hr average scalar speed. Relative Frequency is the number of tropical cyclones passing through the 50 latitude by 50 longitude square per year per time period.

SPEED OF MOVEMENT FOR APR 9 - APR 23

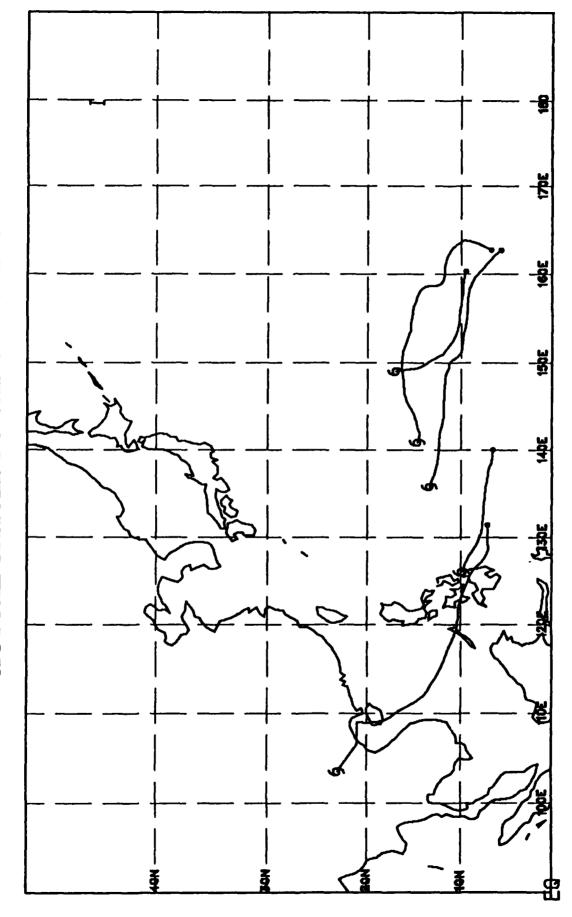


> 33 kts) Speed (top number) in knots and sample size (bottom number) for longitude square. Contours are drawn only to those squares containing at Average tropical cyclone (> 33 kts) Speed each 5° latitude by 5° longitude square. least 5% of the sample.

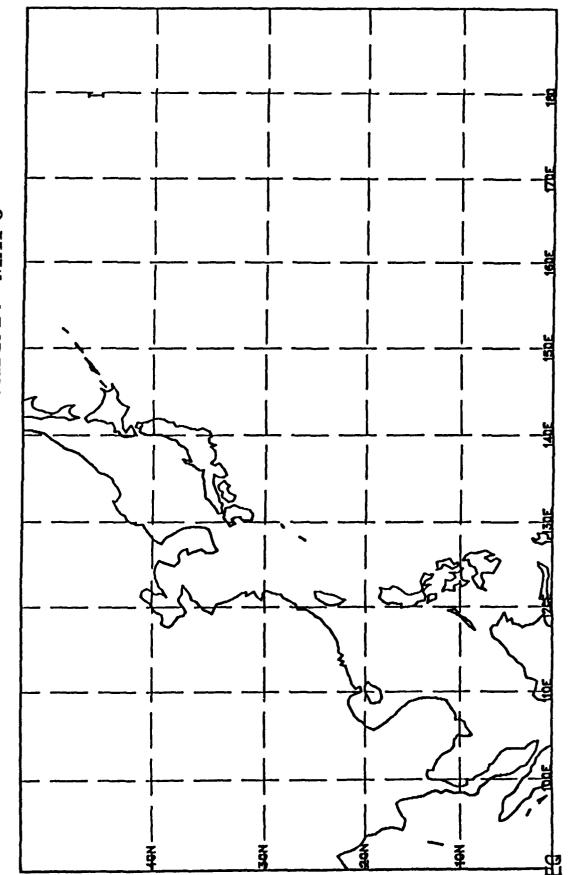
MEAN PATHS FOR APR 24 - MAY 8



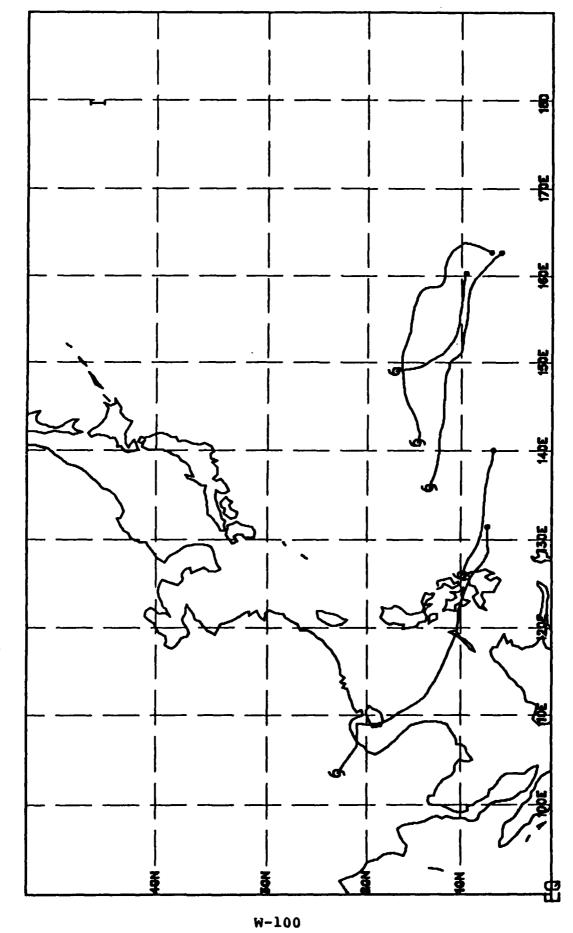
numbers may not add up to 100% since not all tropical cyclones develop/dissipate along a path. Tracks which contained less than Numbers represent the percentage of tropical cyclones (> 33 kts) (> 33 kts) follow a mean path and some develop/dis 5% of the tropical cyclones (> 33 kts) are ignored. These Mean tropical cyclone (> 33 kts) path. which followed the indicated path.



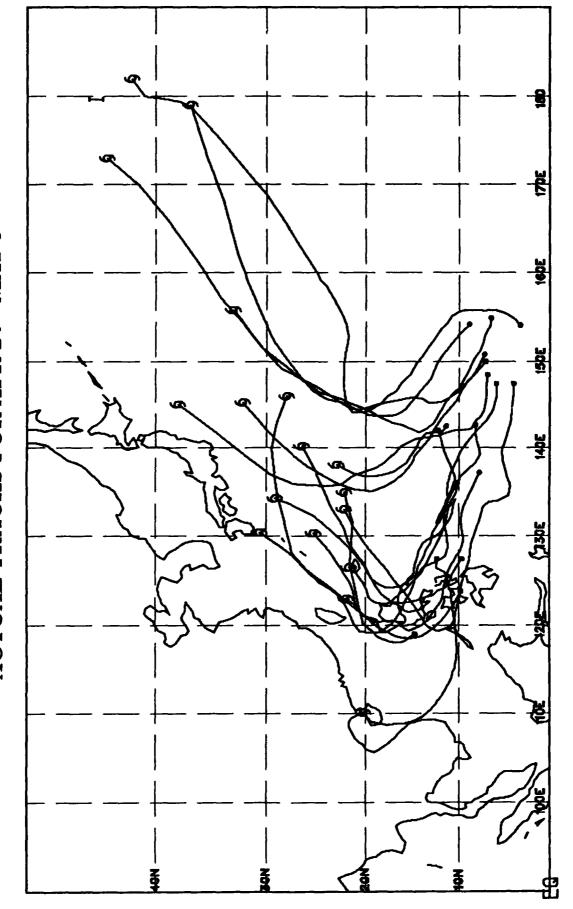
Actual path of straight tropical cyclones (> 33 kts) developing south of 15°N.



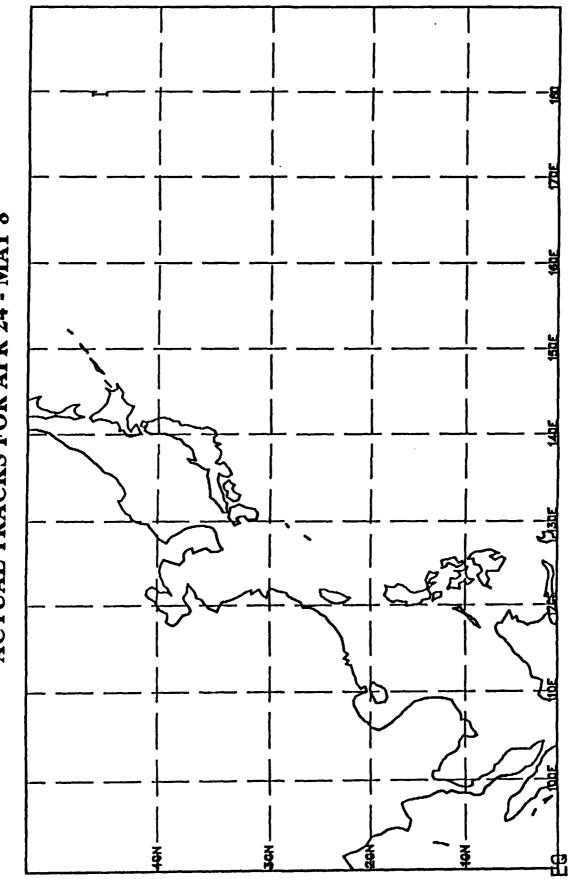
Actual path of straight tropical cyclones (> 33 kts) developing at or north of 15°N.



Actual path of all straight tropical cyclones (> 33 kts).

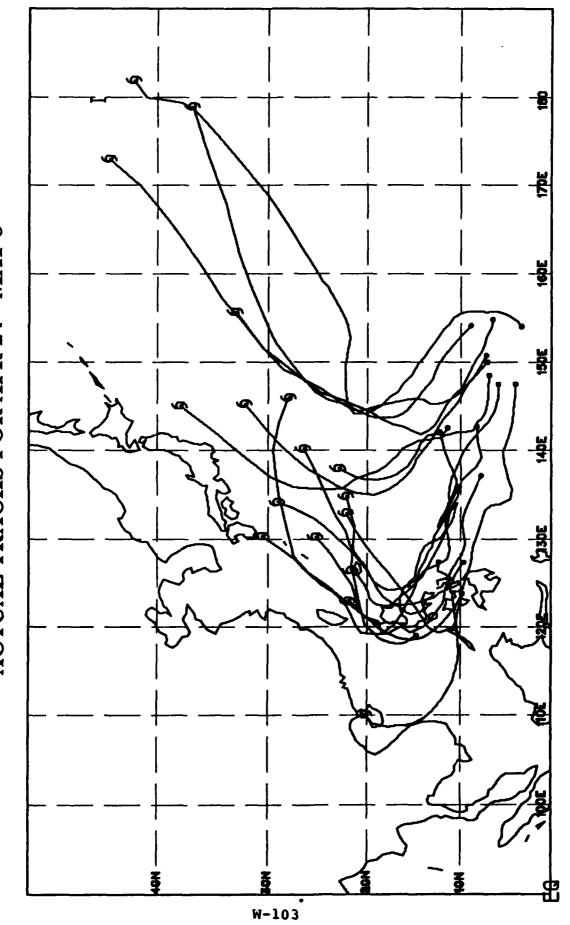


Actual path of recurving tropical cyclones (> 33 kts) developing south of 15°N.

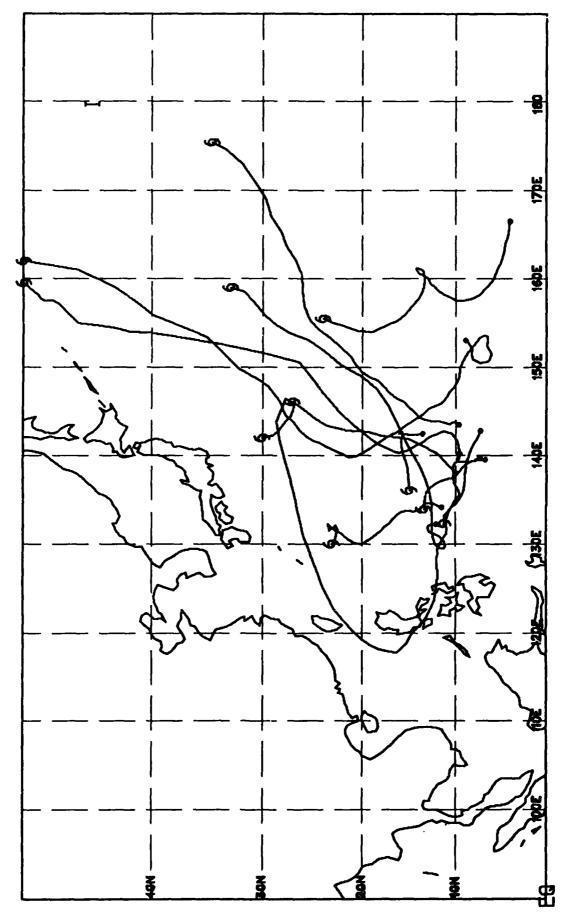


Actual path of recurving tropical cyclones (> 33 kts) developing at or north of 15°N.

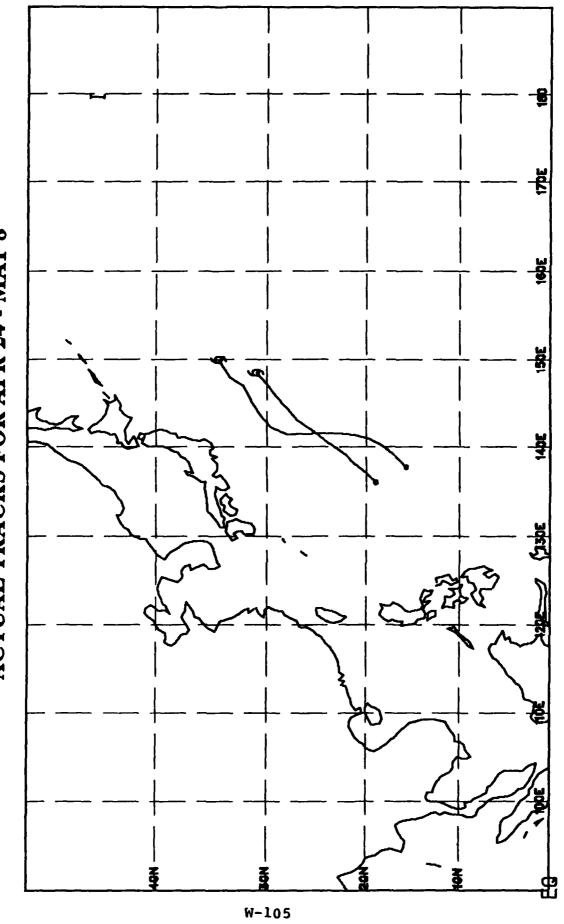
ACTUAL TRACKS FOR APR 24 - MAY 8



Actual path of all recurving tropical cyclones (> 33 kts).



Actual path of other tropical cyclones (>33 kts) developing south of 159N.



Actual path of other tropical cyclones (> 33 kts) developing at or north of 15°N.

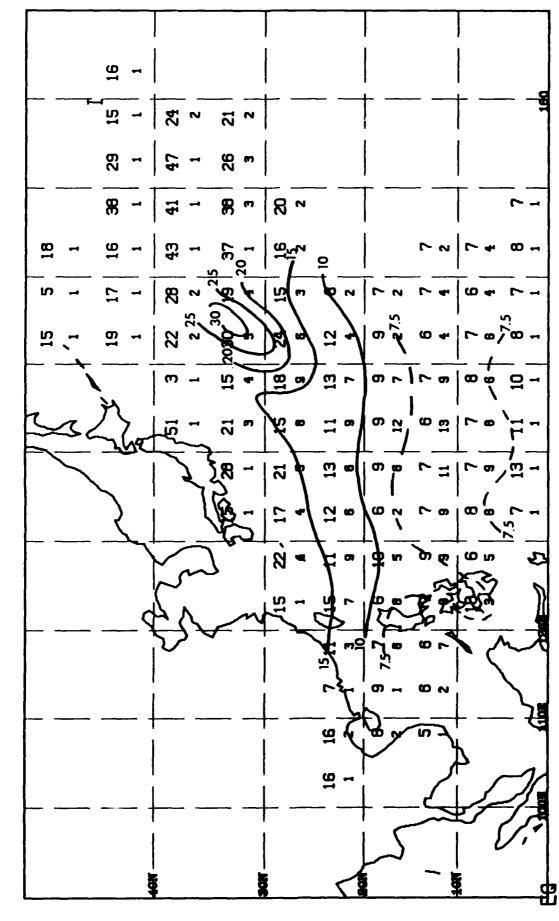
Actual path of all other tropical cyclones (> 33 kts).

CONSTANCY AND RELATIVE FREQUENCY FOR APR 24 - MAY 8

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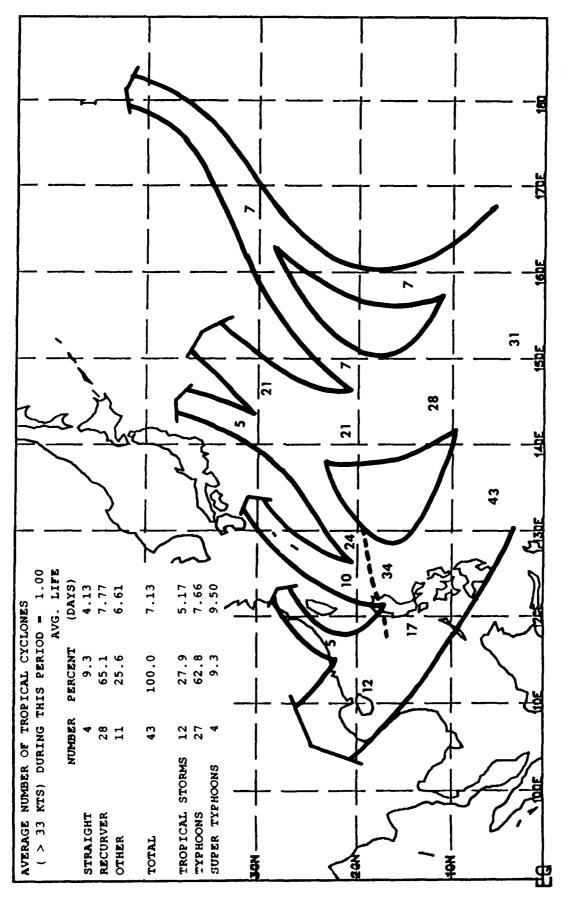
Tropical cyclone (> 33 kts) Constancy (top number) and Relative Frequency (bottom number). Constancy is defined as the 12-hr average vector speed divided by the 12-hr average scalar speed. Relative Frequency is the number of tropical cyclones passing through the 50 latitude by 50 longitude square per year per time period.

SPEED OF MOVEMENT FOR APR 24 - MAY 8

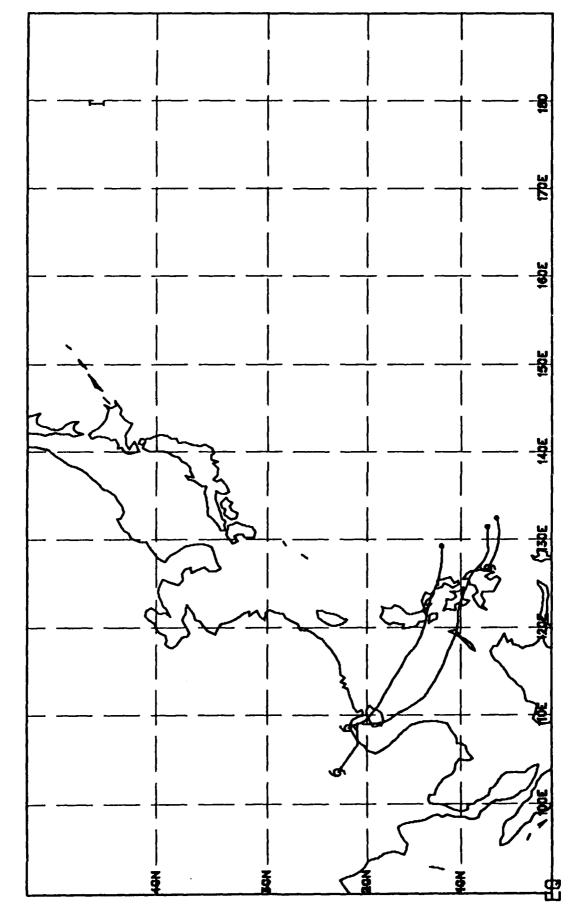


(> 33 kts) Speed (top number) in knots and sample size (bottom number) for longitude square. Contours are drawn only to those squares containing at Average tropical cyclone each 5° latitude by 5° least 5% of the sample.

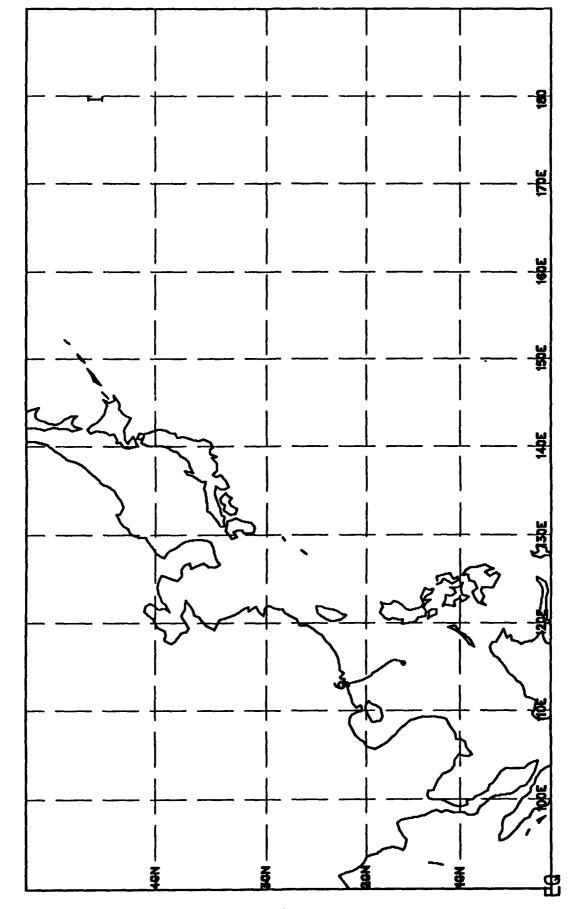
MEAN PATHS FOR MAY 9 - MAY 23



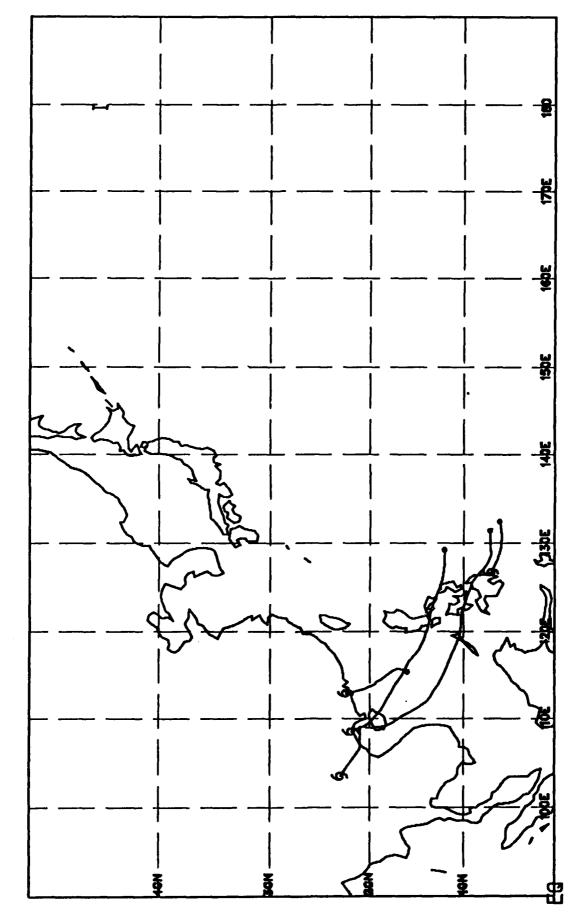
Dashed line represents mean recurvature position of cyclones less than 33 KB) of tropical cyclones (> add up to 100% since not all tropical Tracks which contained percentage path. along a represent may not and some develop/dissipate 33 kts) are ignored. Numbers numbers tropical cyclones (> 33 kts) classified as recurvers. These path. 33 kts) ۸ path cyclones the indicated a mean cyclone (> > 33 kts) follow 5% of the tropical followed tropical which



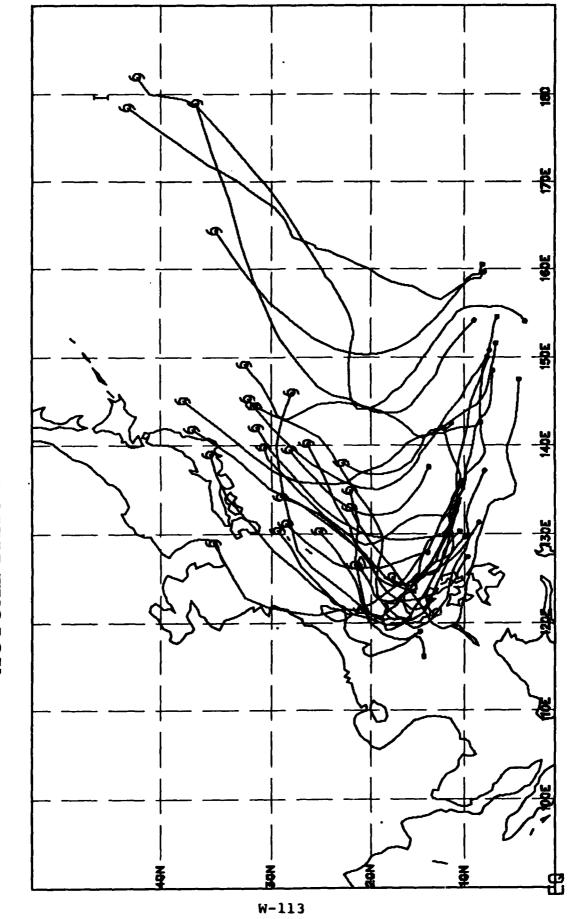
Actual path of straight tropical cyclones (> 33 kts) developing south of 15°N.



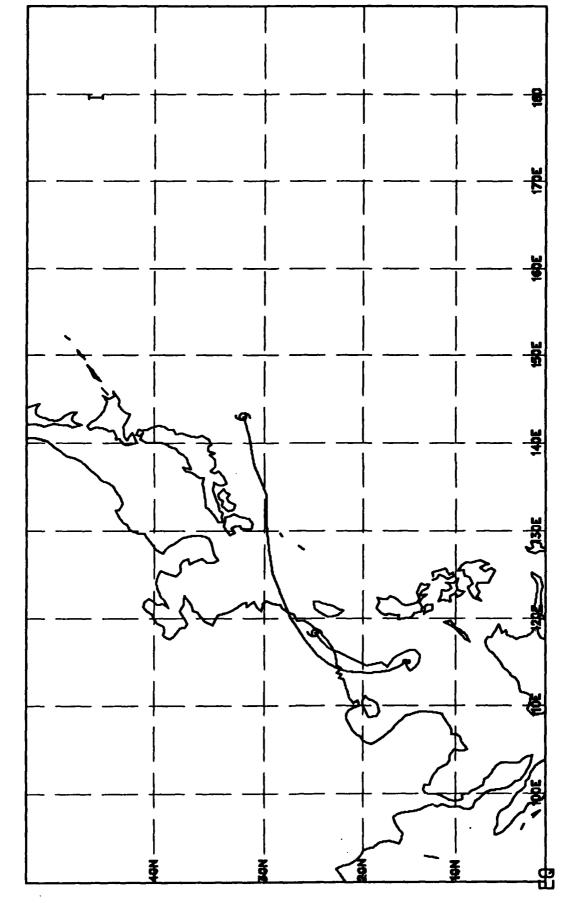
Actual path of straight tropical cyclones (> 33 kts) developing at or north of 15°N.



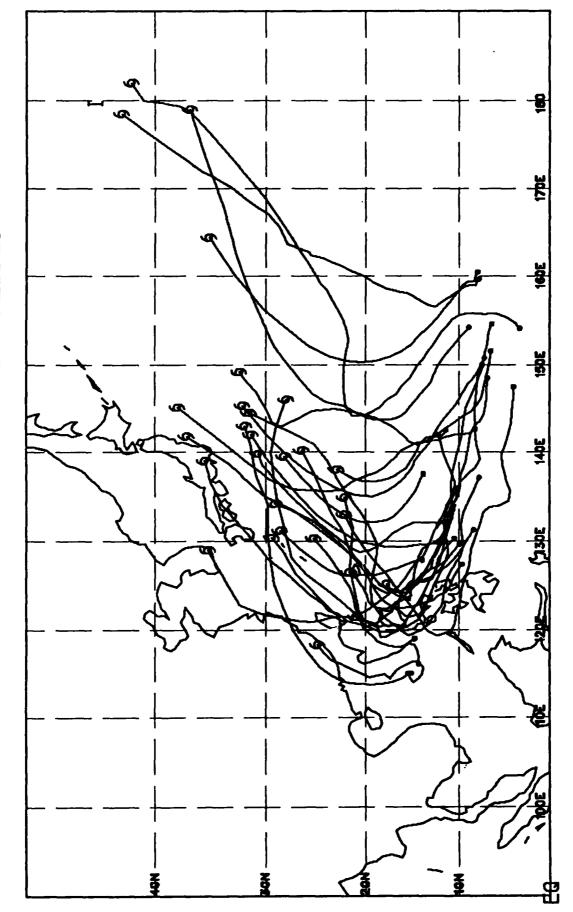
Actual path of all straight tropical cyclones (> 33 kts).



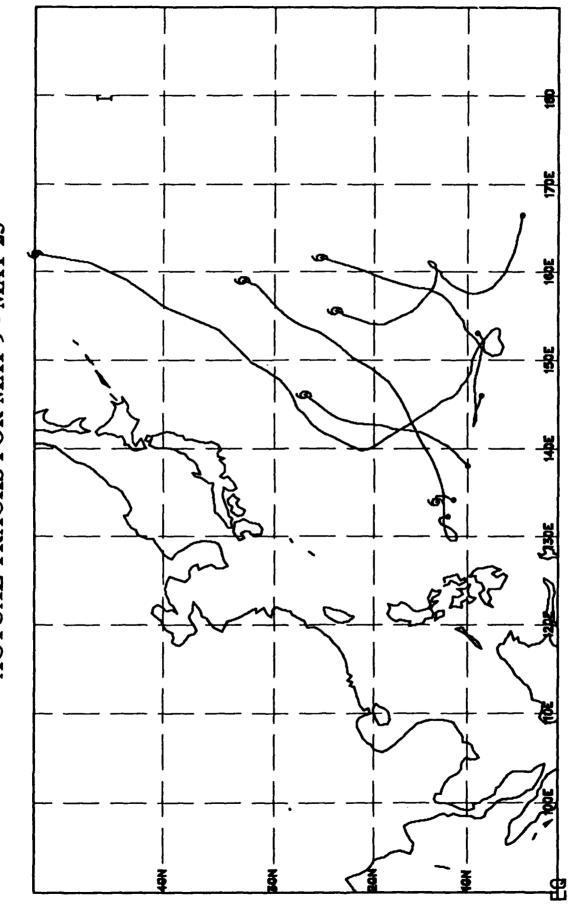
Actual path of recurving tropical cyclones (> 33 kts) developing south of 15°N.



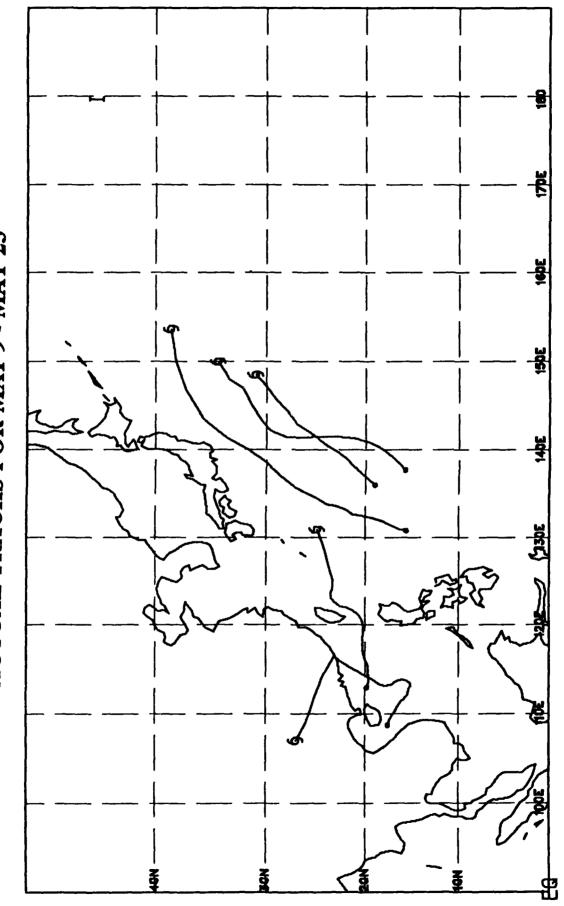
Actual path of recurving tropical cyclones (> 33 kts) developing at or north of 15°N.



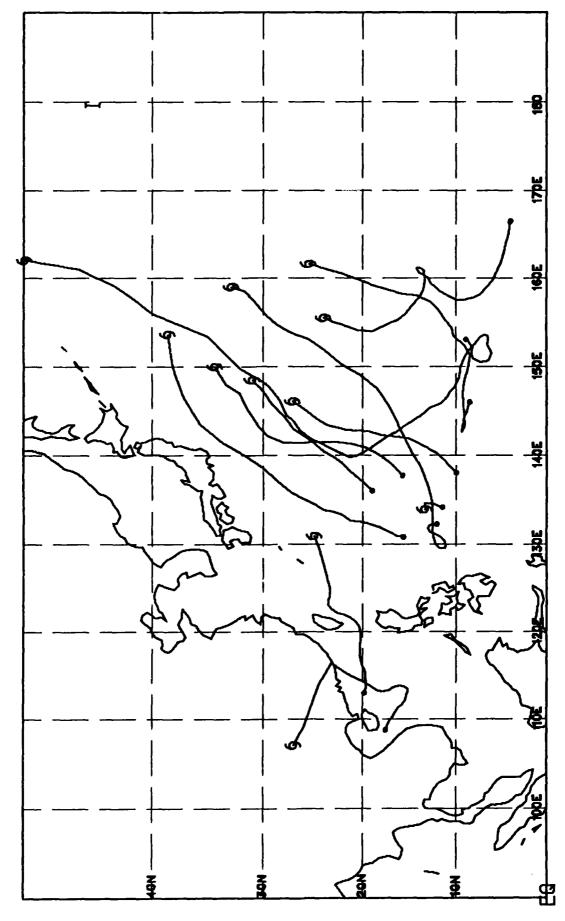
Actual path of all recurving tropical cyclones (> 33 kts).



Actual path of other tropical cyclones (>33 kts) developing south of 15°N.



Actual path of other tropical cyclones (> 33 kts) developing at or north of 15°N.



Actual path of all other tropical cyclones (>33 kts).

CONSTANCY AND RELATIVE FREQUENCY FOR MAY 9 - MAY 23

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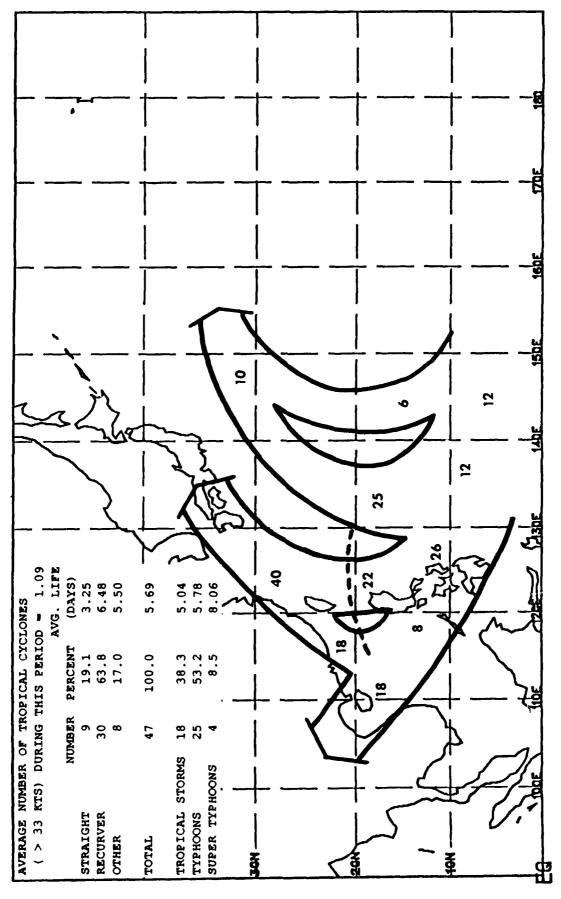
Tropical cyclone (> 33 kts) Constancy (top number) and Relative Frequency (bottom number). Constancy is defined as the 12-hr average vector speed divided by the 12-hr average scalar speed. Relative Frequency is the number of tropical cyclones passing through the 50 latitude by 50 longitude square per year per time period.

SPEED OF MOVEMENT FOR MAY 9 - MAY 23

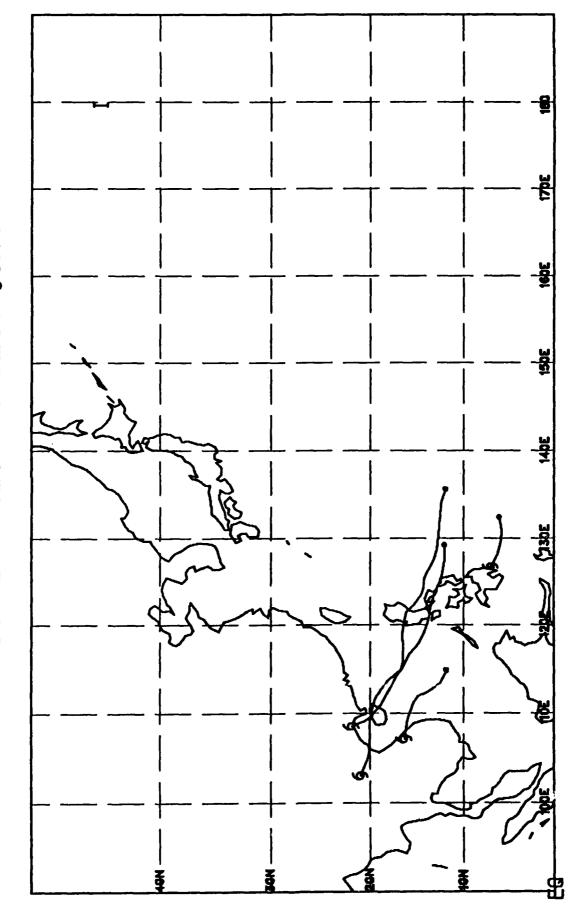
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Average tropical cyclone (> 33 kts) Speed (top number) in knots and sample size (bottom number) for each 50 latitude by 50 longitude square. Contours are drawn only to those squares containing at least 5% of the sample.

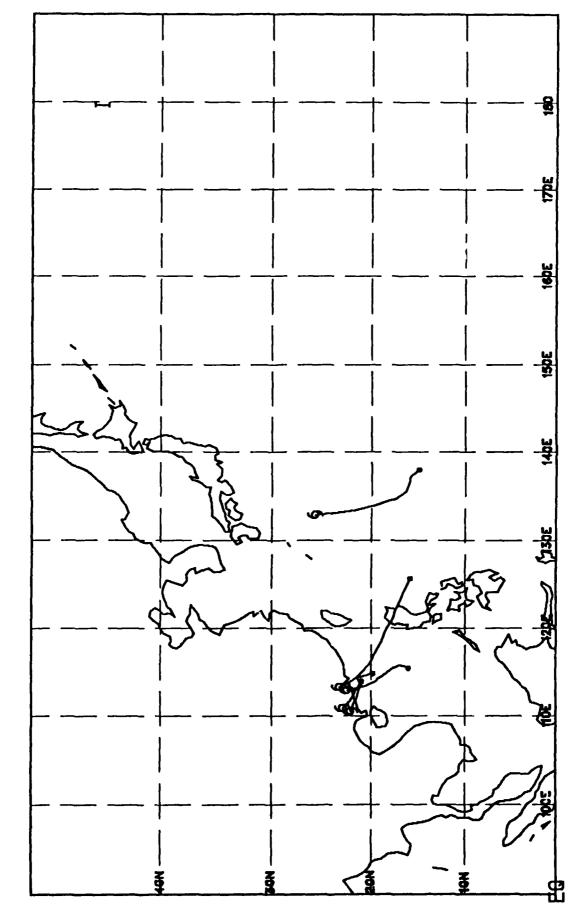
MEAN PATHS FOR MAY 24 - JUN 8



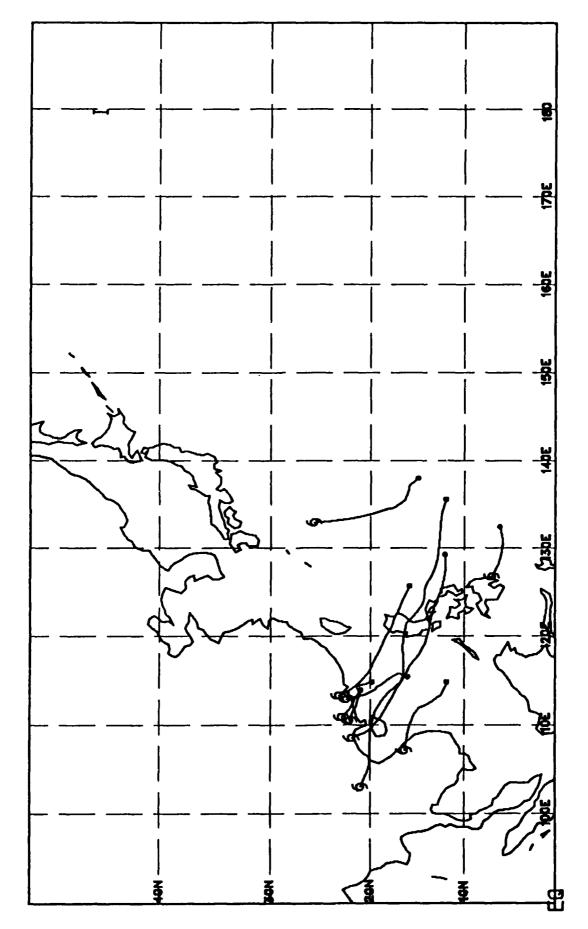
Dashed line represents mean recurvature position of Tracks which contained less than 33 kts) cyclones of tropical cyclones (> the percentage or unpression and up to 100% since not all tropical along a path. may not represent develop/dissipate 33 kts) are ignored. Numbers numbers tropical cyclones (> 33 kts) classified as recurvers and some These path. 33 kts) path. path ^ cyclones which followed the indicated a mean cyclone (> 33 kts) follow 5% of the tropical tropical Mean



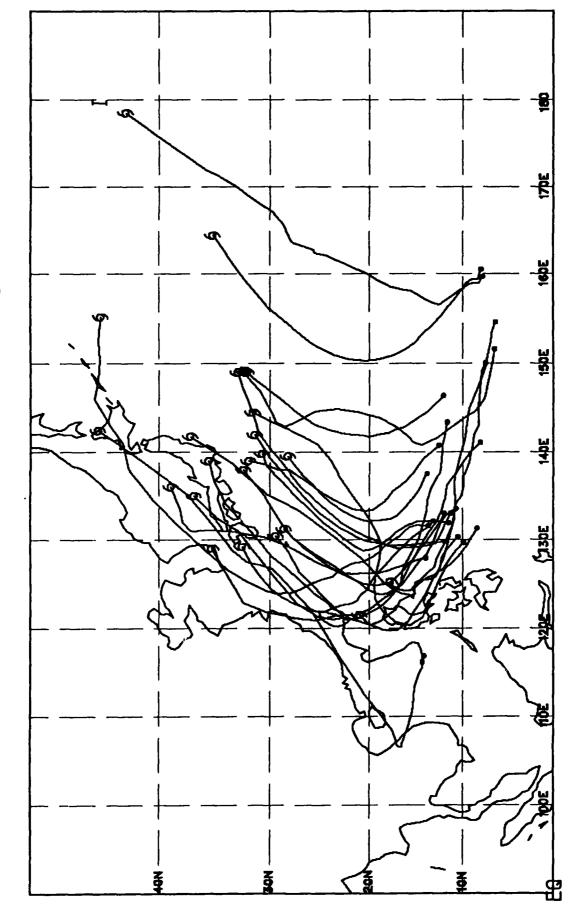
Actual path of straight tropical cyclones (> 33 kts) developing south of 15°N.



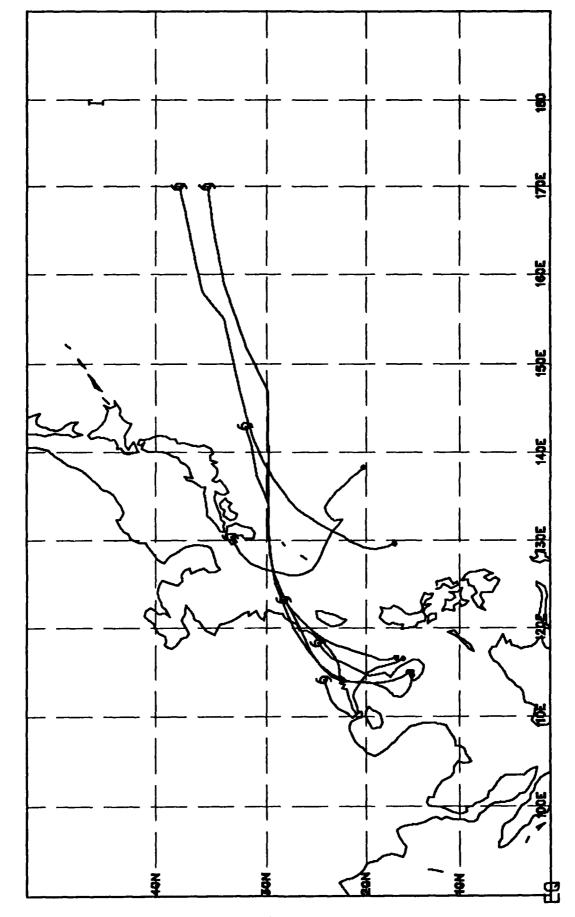
Actual path of straight tropical cyclones (> 33 kts) developing at or north of 15^{0} N.



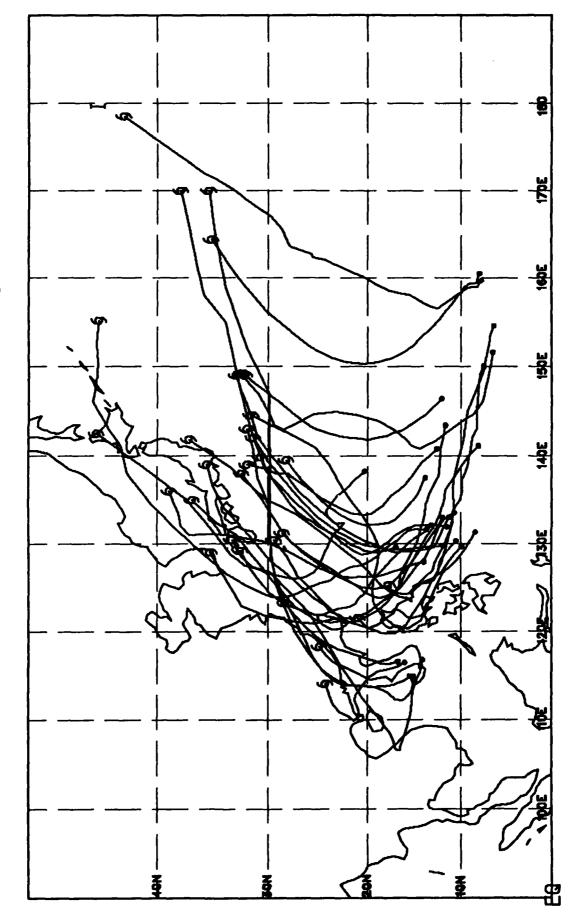
Actual path of all straight tropical cyclones (> 33 kts).



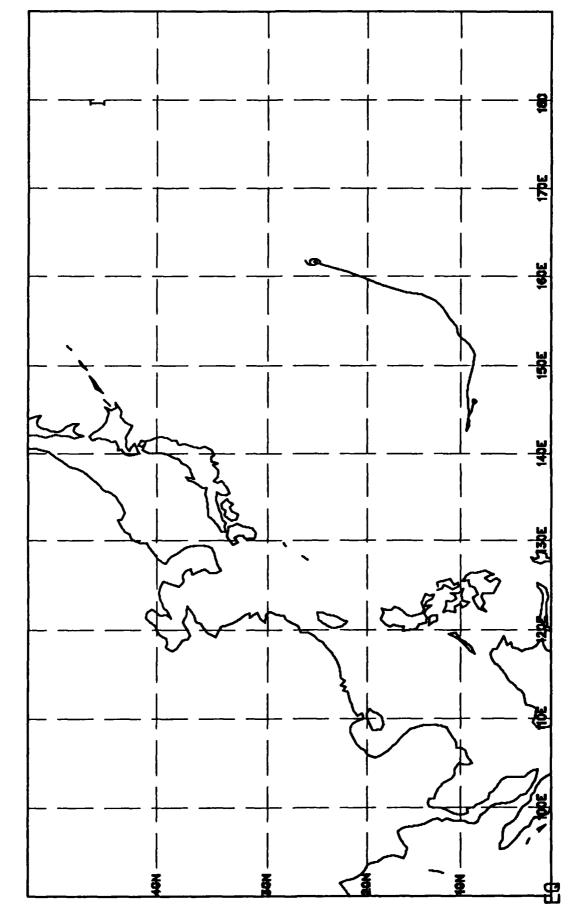
Actual path of recurving tropical cyclones (> 33 kts) developing south of 150N.



Actual path of recurving tropical cyclones (> 33 kts) developing at or north of 15°N.

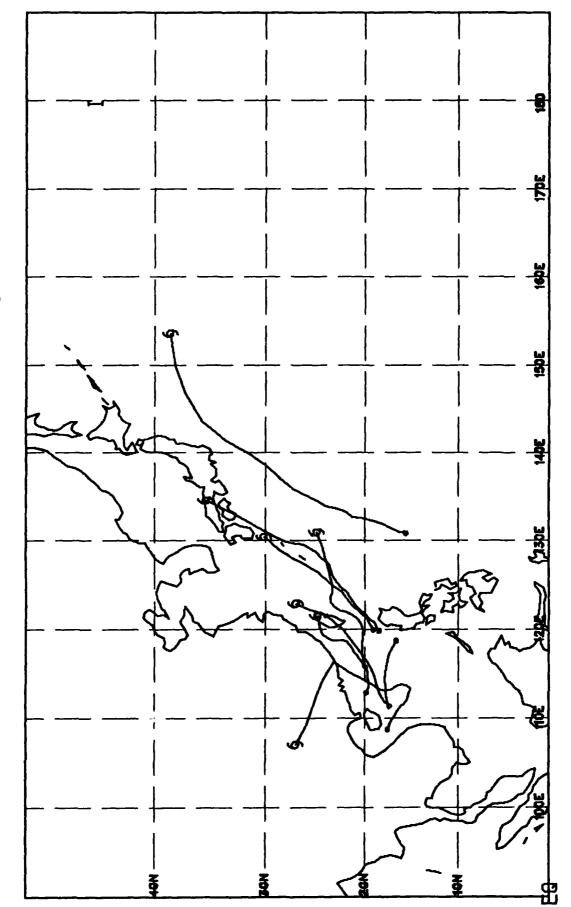


Actual path of all recurving tropical cyclones (> 33 kts).

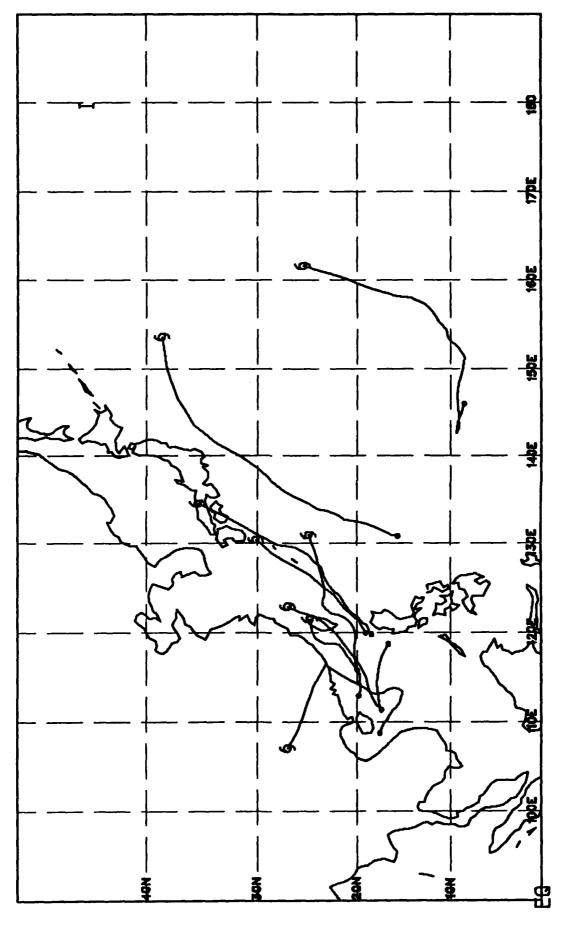


Actual path of other tropical cyclones (>33 kts) developing south of 15°N.

ACTUAL TRACKS FOR MAY 24 - JUN 8



Actual path of other tropical cyclones (> 33 kts) developing at or north of 15°N.



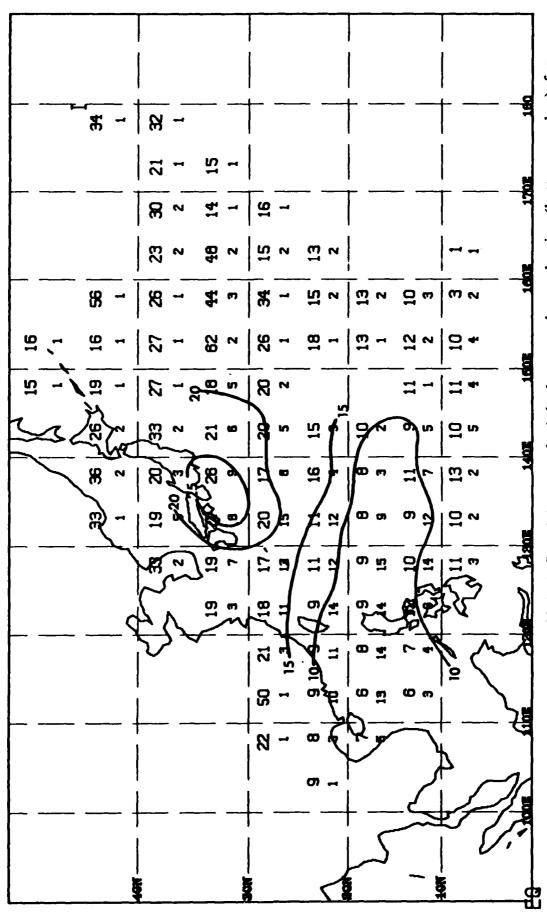
Actual path of all other tropical cyclones (>33 kts).

CONSTANCY AND RELATIVE FREQUENCY FOR MAY 24 - JUN 8

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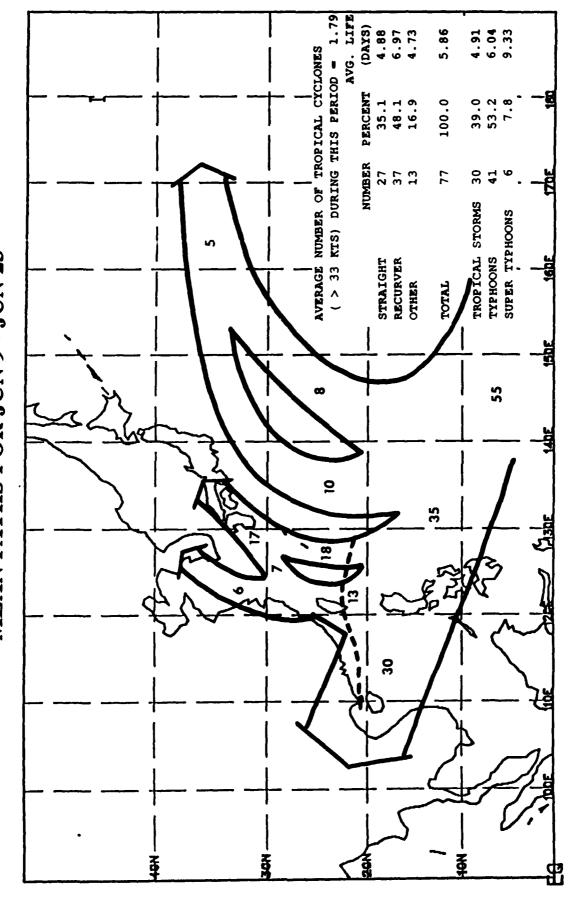
Tropical cyclone (> 33 kts) Constancy (top number) and Relative Frequency (bottom number). Constancy is defined as the 12-hr average vector speed divided by the 12-hr average scalar speed. Relative Frequency is the number of tropical cyclones passing through the 50 latitude by 50 longitude square per year per time period.

SPEED OF MOVEMENT FOR MAY 24 - JUN 8

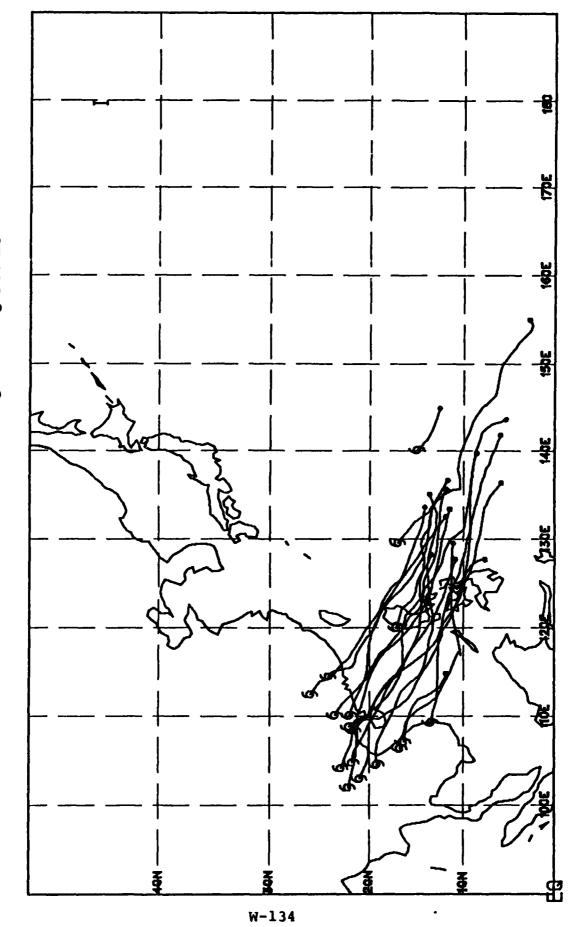


(> 33 kts) Speed (top number) in knots and sample size (bottom number) for longitude square. Contours are drawn only to those squares containing at Average tropical cyclone each 5° latitude by 5° least 5% of the sample.

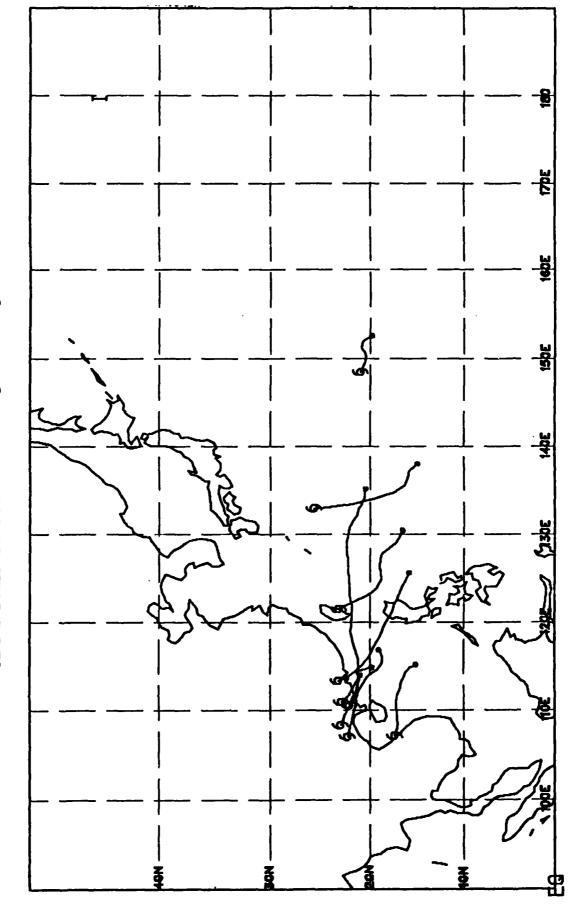
MEAN PATHS FOR JUN 9 - JUN 23



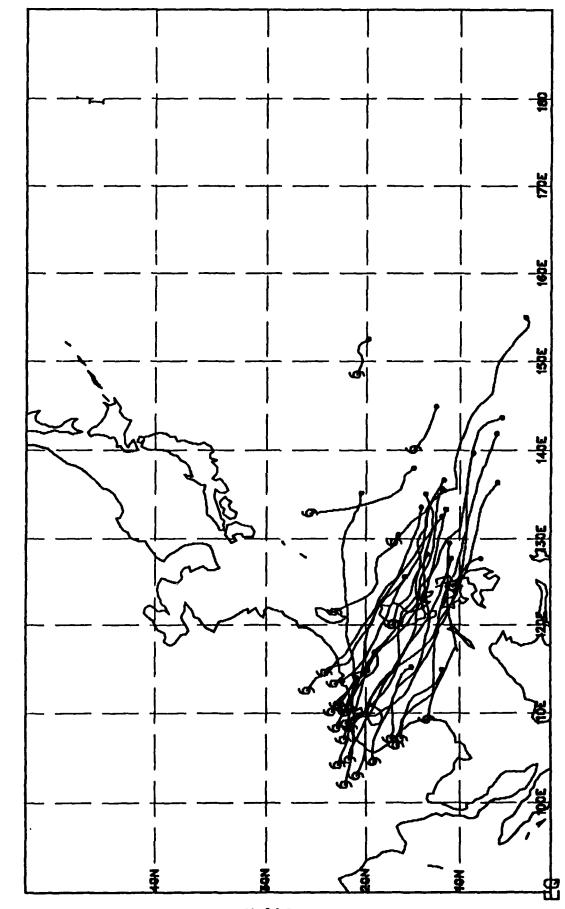
Dashed line represents mean recurvature position of cyclones Tracks which contained less than of tropical cyclones (> up to 100% since not all tropical percentage along a path. represent may not develop/dissipate 33 kts) are ignored. Numbers numbers and some tropical cyclones (> 33 kts) classified as recurvers. These 33 kts) path. path cyclones followed the indicated a mean cyclone 33 kts) follow 5% of the tropical tropical which Mean



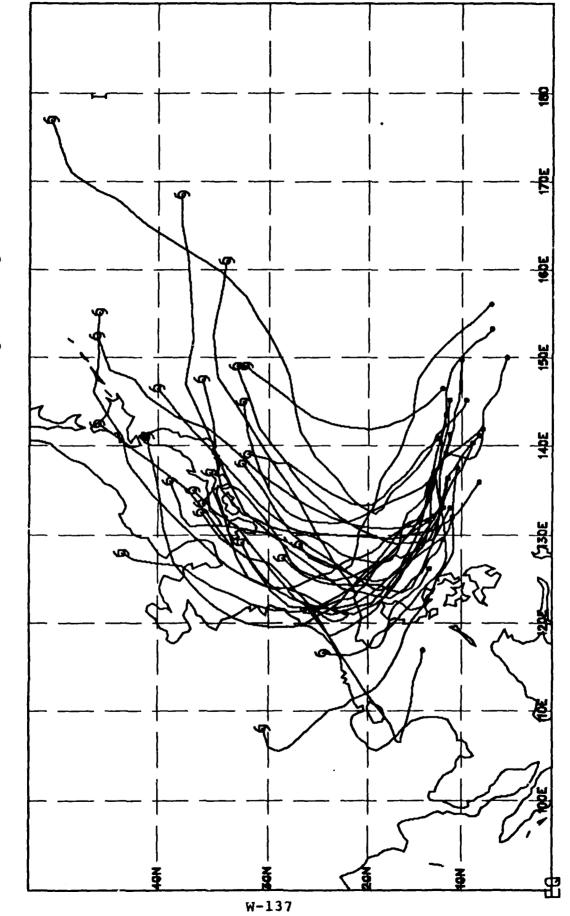
Actual path of straight tropical cyclones (> 33 kts) developing south of 15°N.



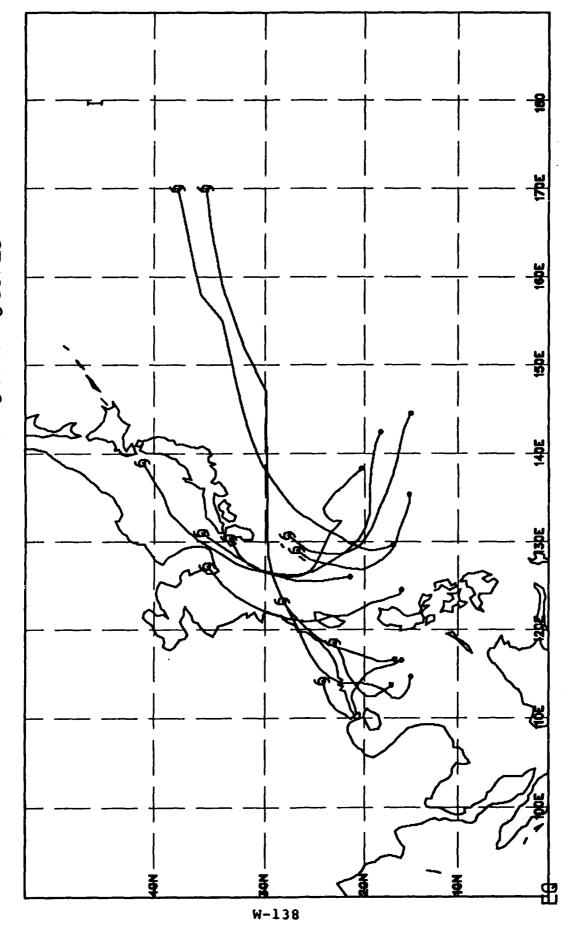
Actual path of straight tropical cyclones (> 33 kts) developing at or north of 15°N.



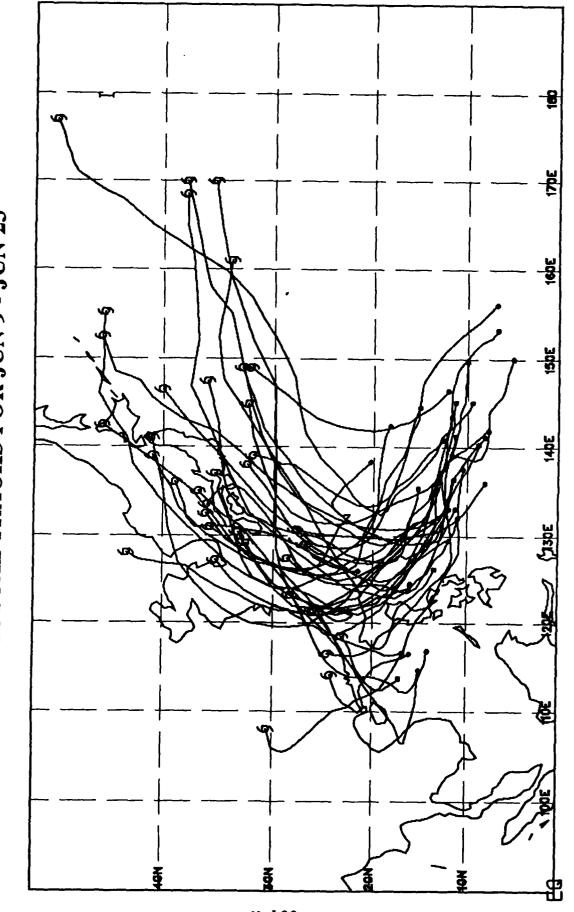
Actual path of all straight tropical cyclones (> 33 kts).



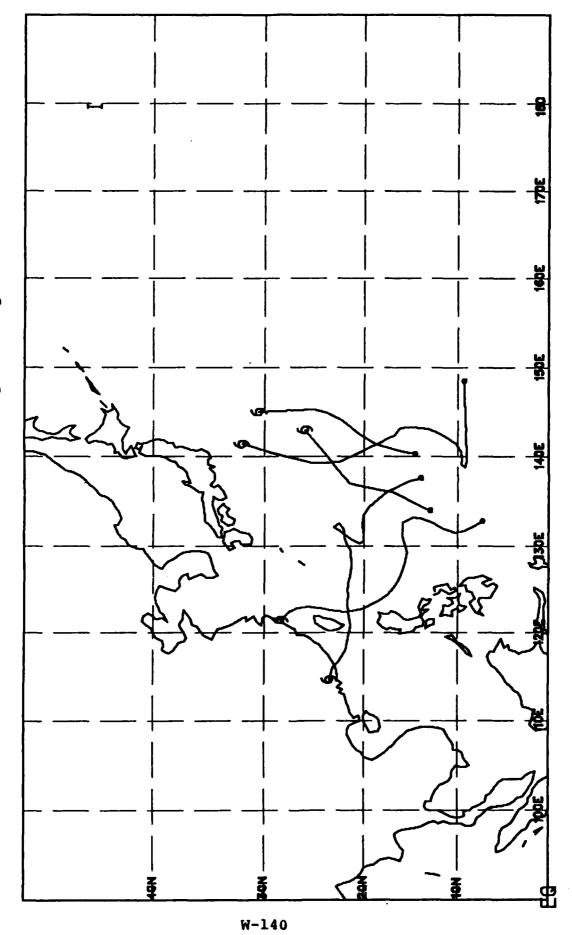
Actual path of recurving tropical cyclones (> 33 kts) developing south of 15°N.



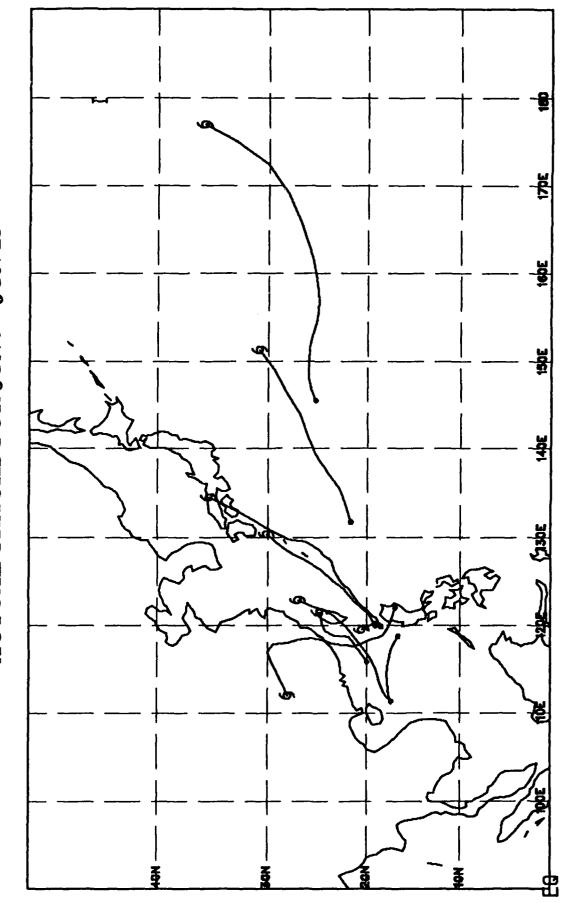
Actual path of recurving tropical cyclones (> 33 kts) developing at or north of 15°N.



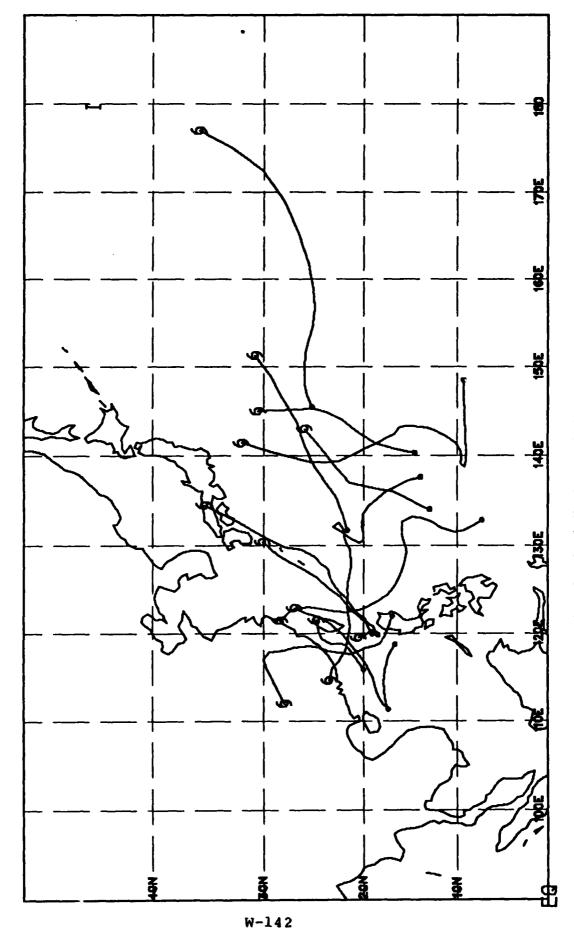
Actual path of all recurving tropical cyclones (> 33 kts).



Actual path of other tropical cyclones (>33 kts) developing south of 15°N.



Actual path of other tropical cyclones (> 33 kts) developing at or north of 15°N.



Actual path of all other tropical cyclones (> 33 kts).

CONSTANCY AND RELATIVE FREQUENCY FOR JUN 9 - JUN 23

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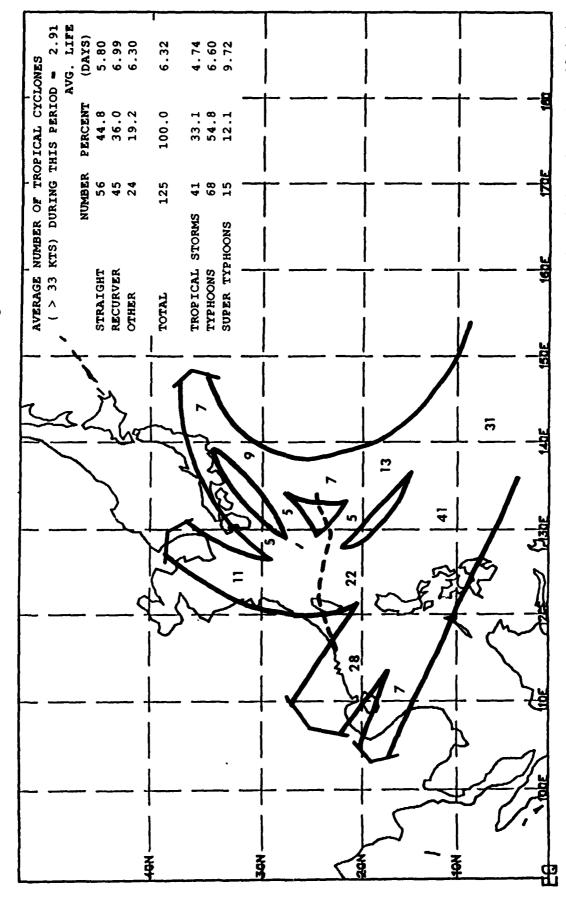
Tropical cyclone (> 33 kts) Constancy (top number) and Relative Frequency (bottom number). Constancy is defined as the 12-hr average vector speed divided by the 12-hr average scalar speed. Relative Frequency is the number of tropical cyclones passing through the 50 latitude by 50 longitude square per year per time period.

SPEED OF MOVEMENT FOR JUN 9 - JUN 23

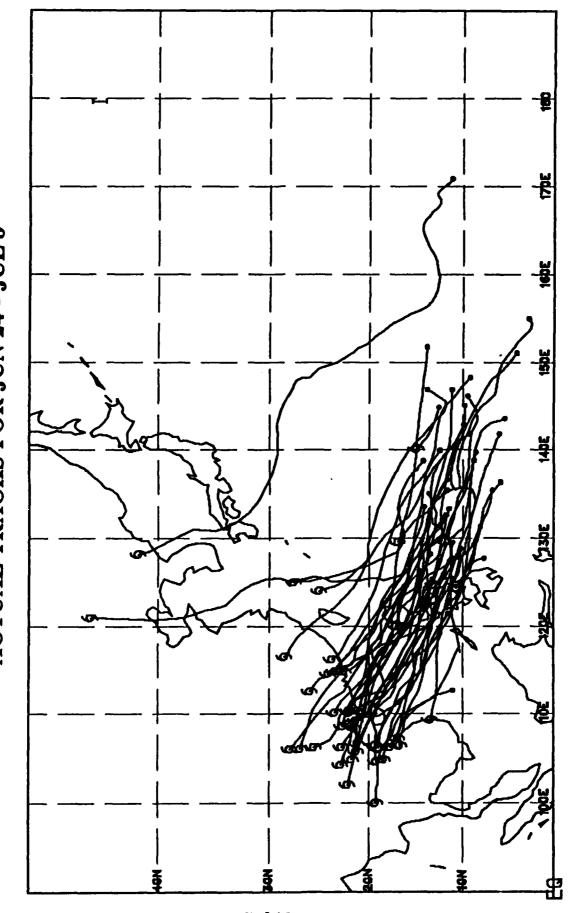
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Average tropical cyclone (> 33 kts) Speed (top number) in knots and sample size (bottom number) for each 5° latitude by 5° longitude square. Contours are drawn only to those squares containing at least 5% of the sample.

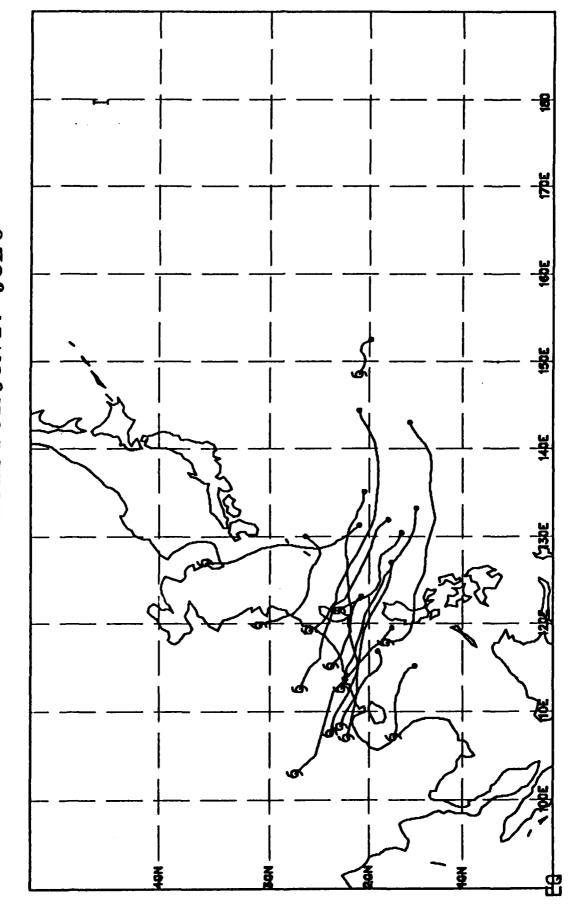
MEAN PATHS FOR JUN 24 - JUL 8



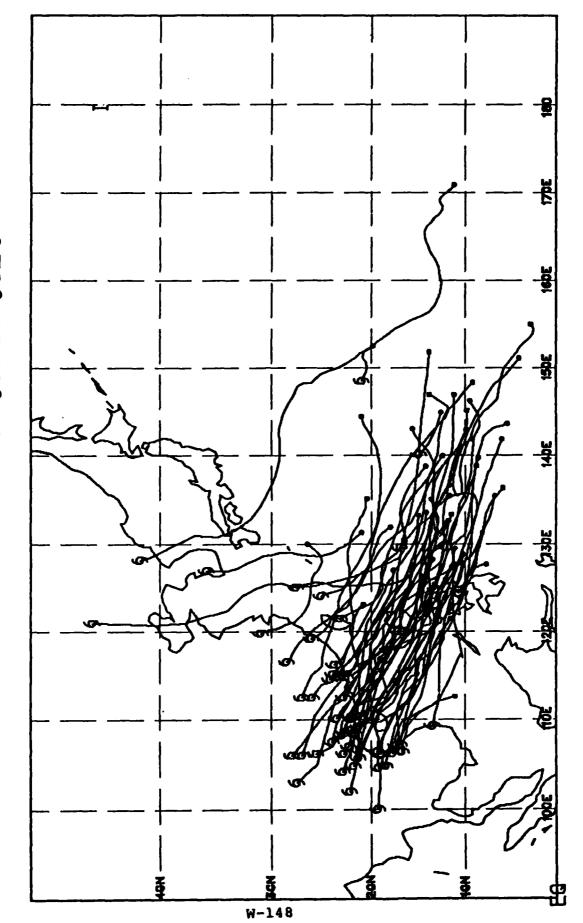
Dashed line represents mean recurvature position of 33 km) cyclones Tracks which contained less than of tropical cyclones (> 100% since not all tropical percentage a path. up to along 뒇 represent may not and some develop/dissipate > 33 kts) are ignored. Numbers numbers tropical cyclones (> 33 kts) classified as recurvers. These 33 kts) path. path. path cyclones the indicated a mean cyclone (> 33 kts) follow 5% of the tropical followed tropical which Mean ۸



Actual path of straight tropical cyclones (> 33 kts) developing south of 15°N.

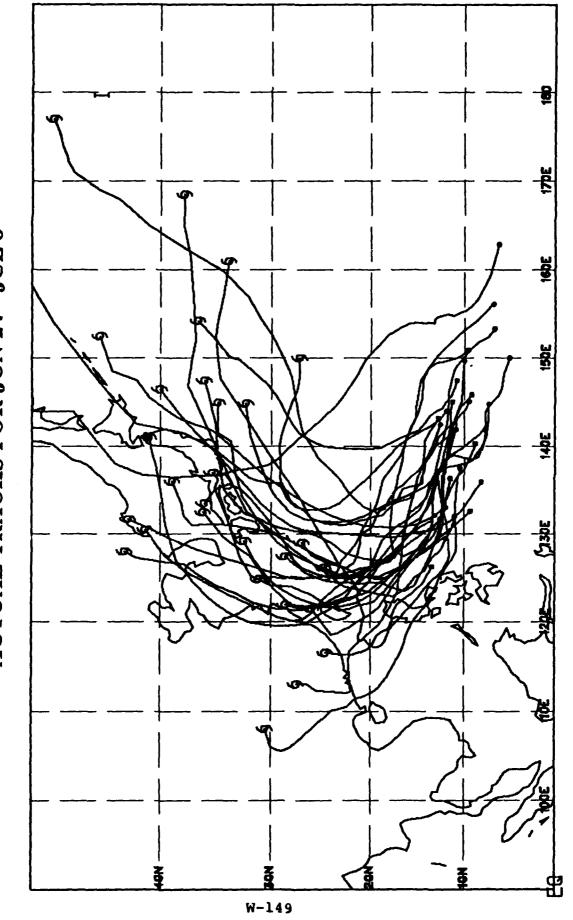


Actual path of straight tropical cyclones (> 33 kts) developing at or north of 15°N.

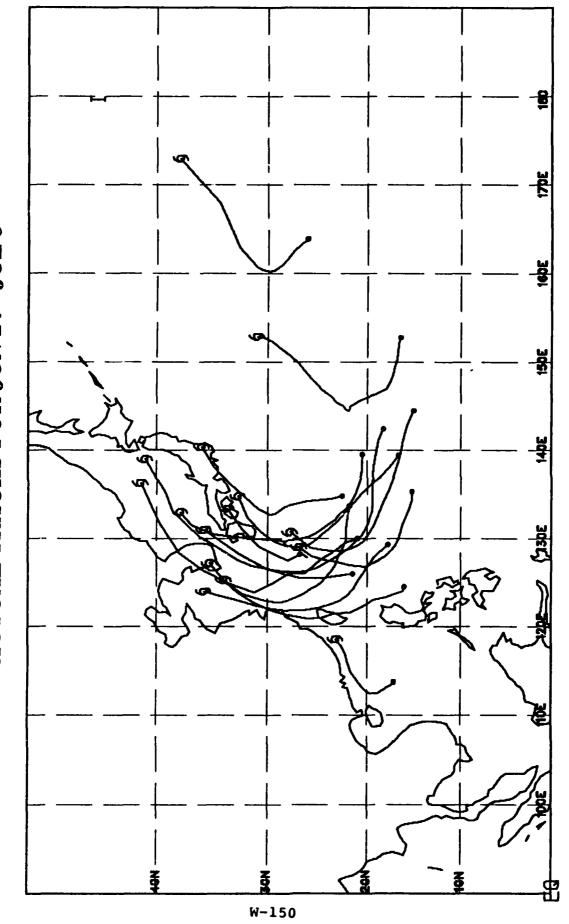


Actual path of all straight tropical cyclones (> 33 kts).

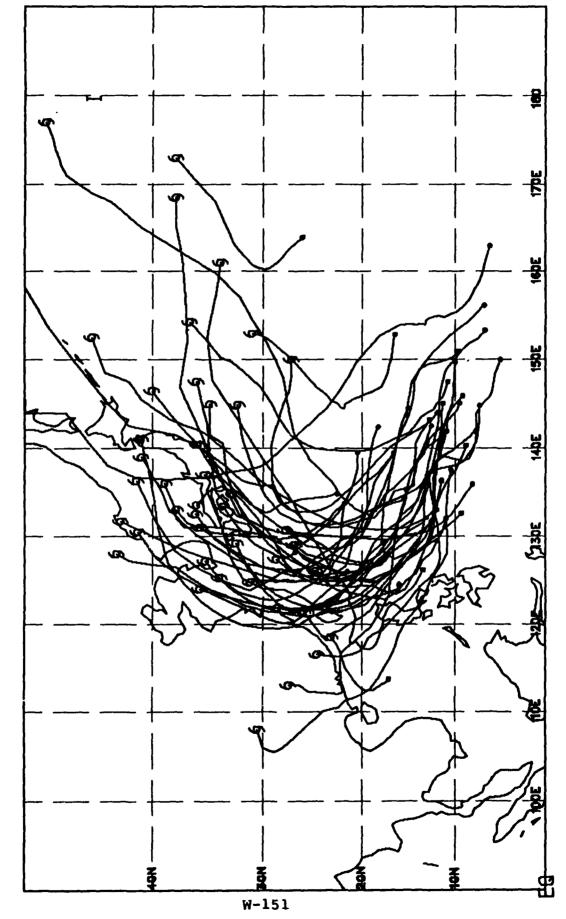
ACTUAL TRACKS FOR JUN 24 - JUL 8



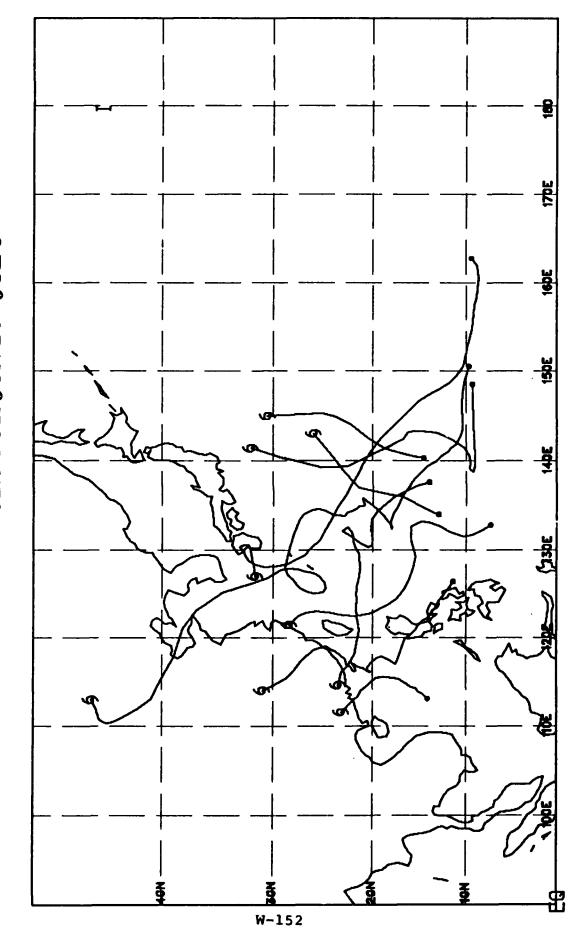
Actual path of recurving tropical cyclones (> 33 kts) developing south of 15°N.



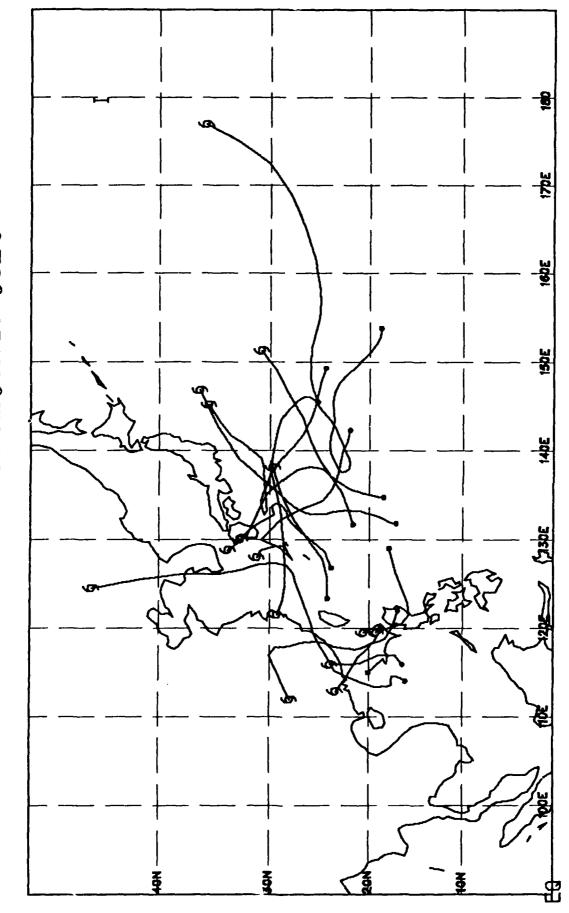
Actual path of recurving tropical cyclones (> 33 kts) developing at or north of 15°N.



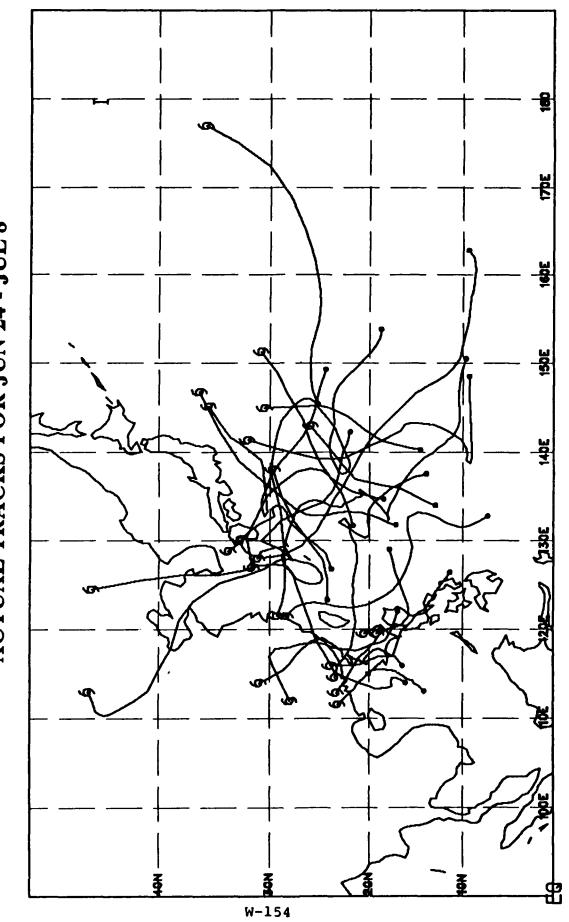
Actual path of all recurving tropical cyclones (> 33 kts).



Actual path of other tropical cyclones (> 33 kts) developing south of 15^{0} N.



Actual path of other tropical cyclones (> 33 kts) developing at or north of 15°N.



Actual path of all other tropical cyclones (> 33 kts).

CONSTANCY AND RELATIVE FREQUENCY FOR JUN 24 - JUL 8

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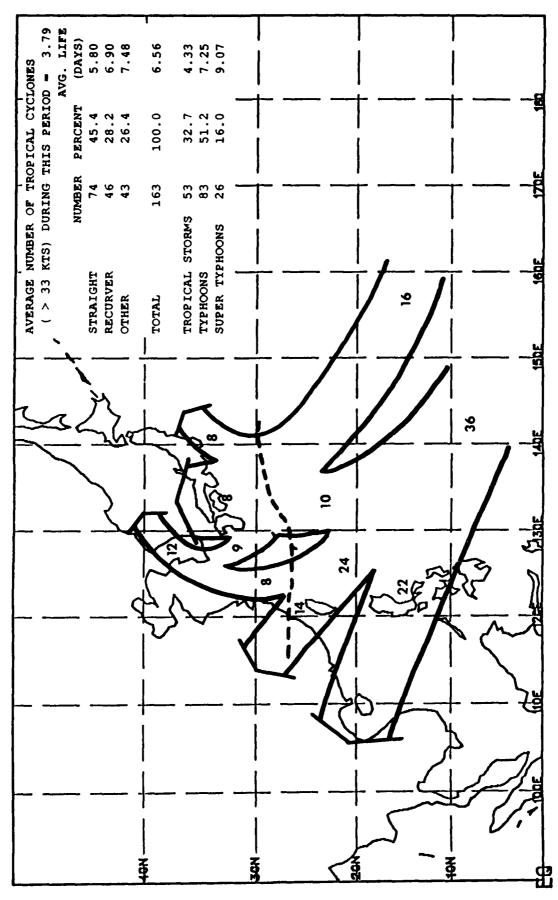
Tropical cyclone (> 33 kts) Constancy (top number) and Relative Frequency (bottom number). Constancy is defined as the 12-hr average vector speed divided by the 12-hr average scalar speed. Relative Frequency is the number of tropical cyclones passing through the 50 latitude by 50 longitude square per year per time period.

SPEED OF MOVEMENT FOR JUN 24 - JUL 8

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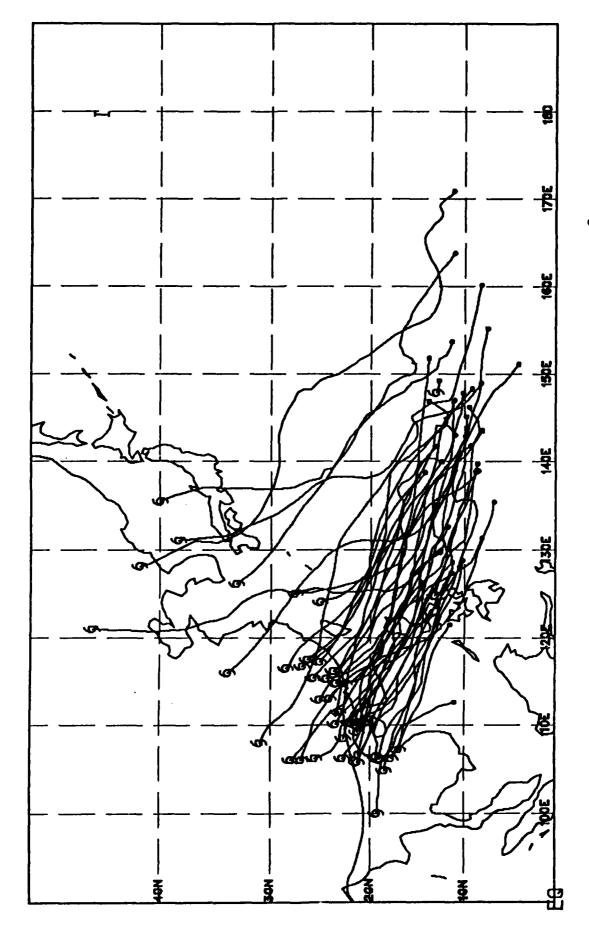
Average tropical cyclone (> 33 kts) Speed (top number) in knots and sample size (bottom number) for each 5° latitude by 5° longitude square. Contours are drawn only to those squares containing at least 5% of the sample.

MEAN PATHS FOR JUL 9 - JUL 23

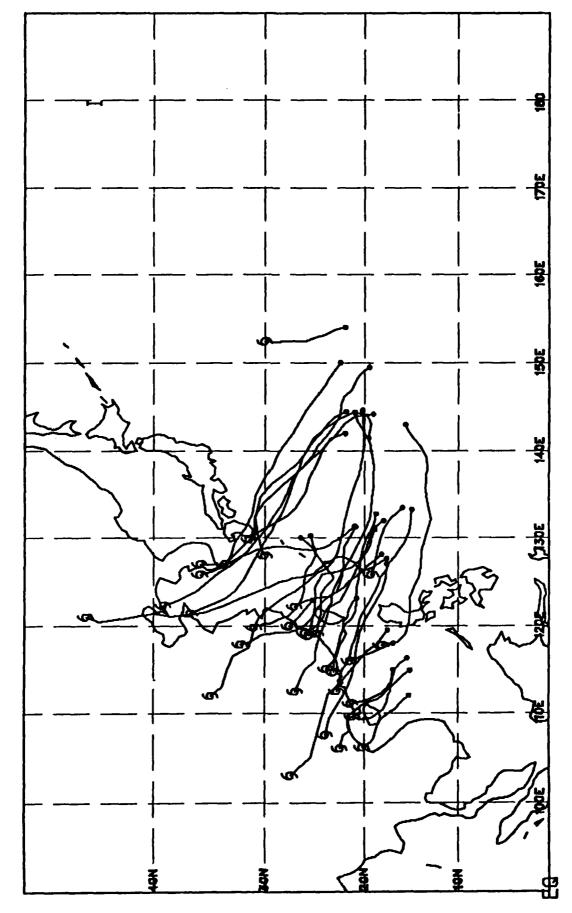


Dashed line represents mean recurvature position of cyclones less than 33 kts) of tropical cyclones (> add up to 100% since not all tropical along a path. Tracks which contained percentage along may not represent and some develop/dissipate > 33 kts) are ignored. Numbers numbers tropical cyclones (> 33 kts) classified as recurvers. These path. 33 kts) path. path cyclones followed the indicated a mean cyclone (> 33 kts) follow 5% of the tropical tropical which Mean

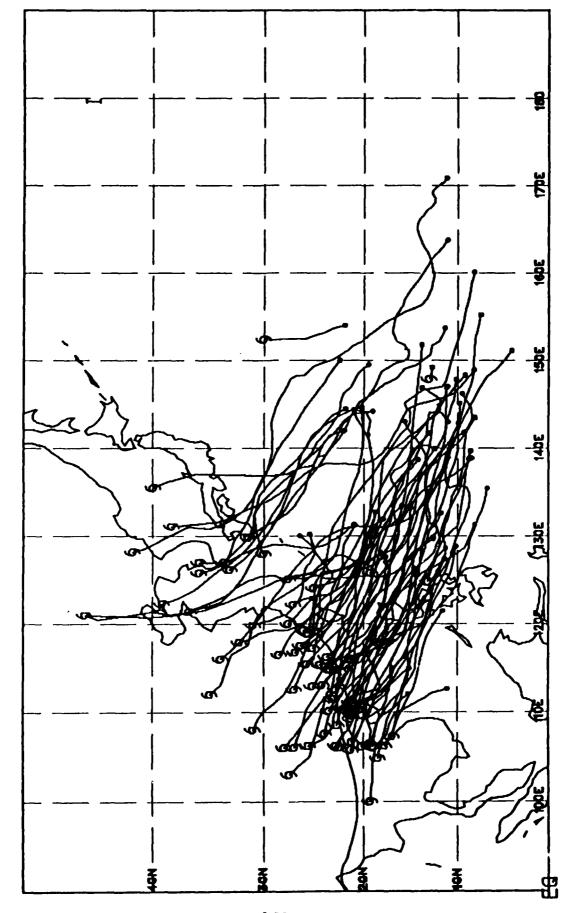
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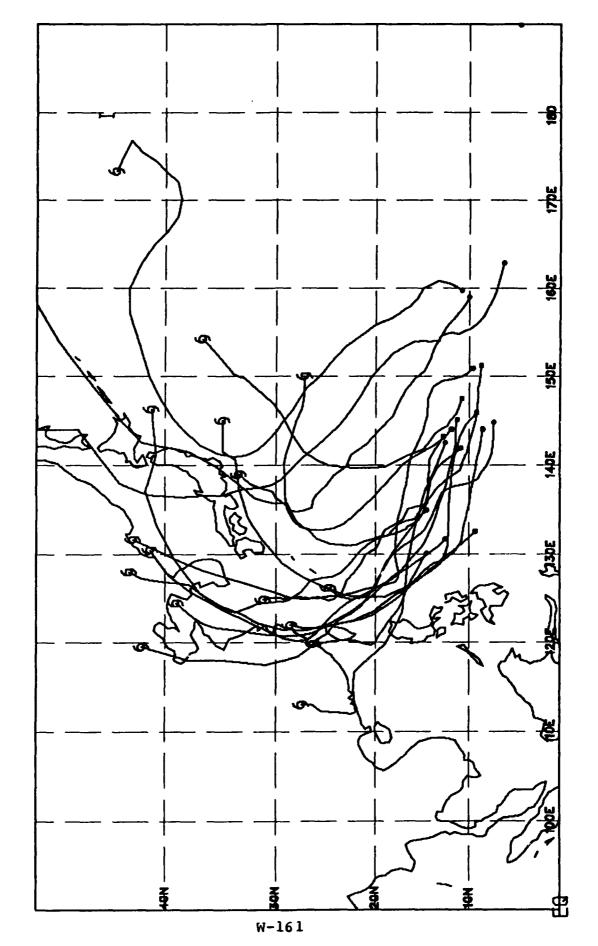
Actual path of straight tropical cyclones (> 33 kts) developing south of 15°N.



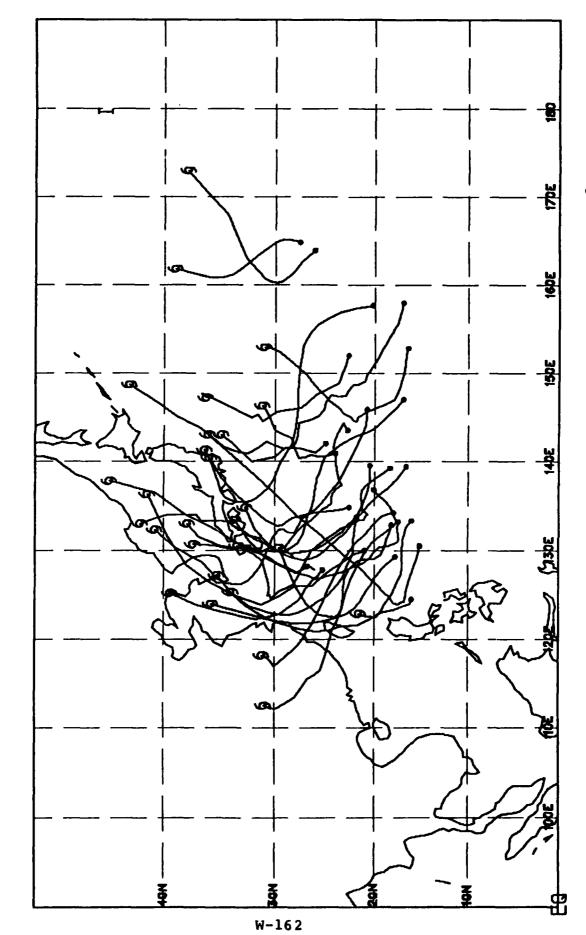
Actual path of straight tropical cyclones (> 33 kts) developing at or north of 15°N.



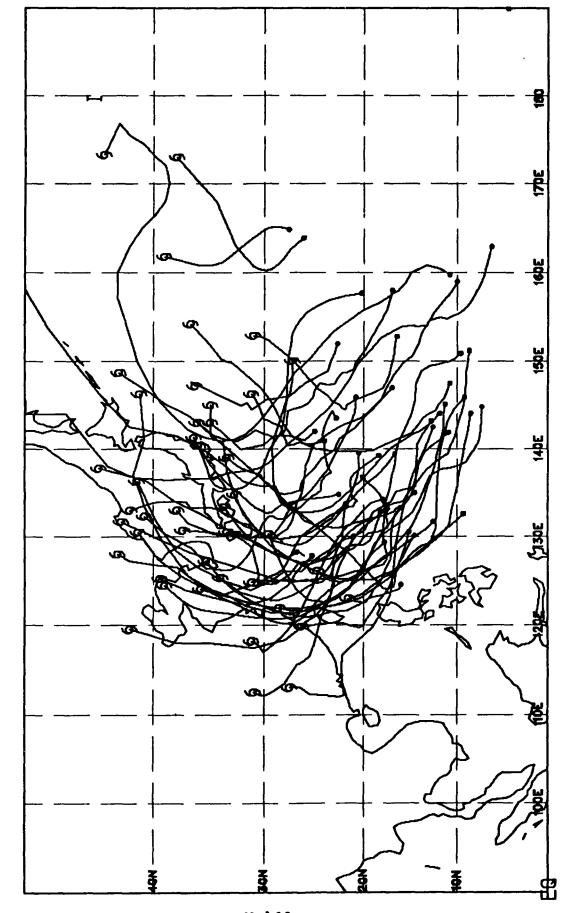
Actual path of all straight tropical cyclones (> 33 kts).



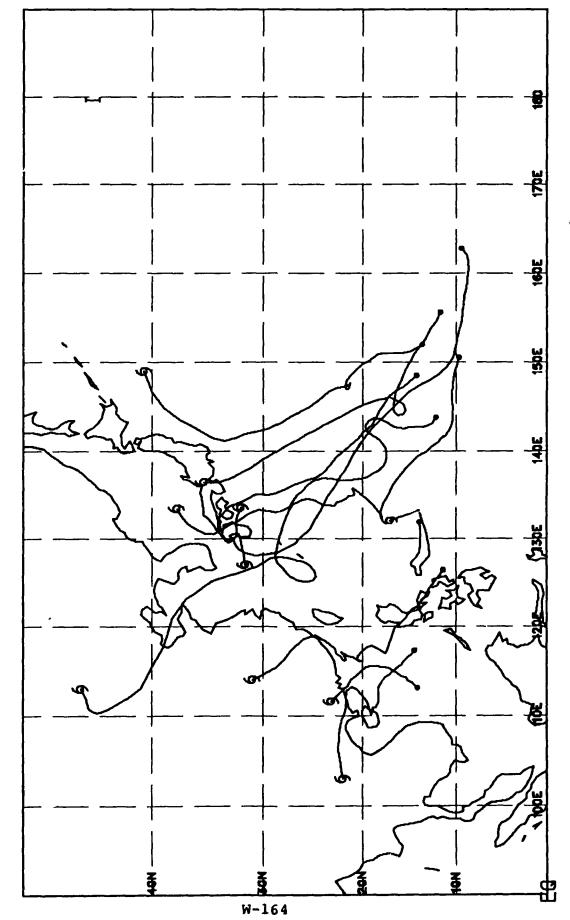
Actual path of recurving tropical cyclones (> 33 kts) developing south of 15°N.



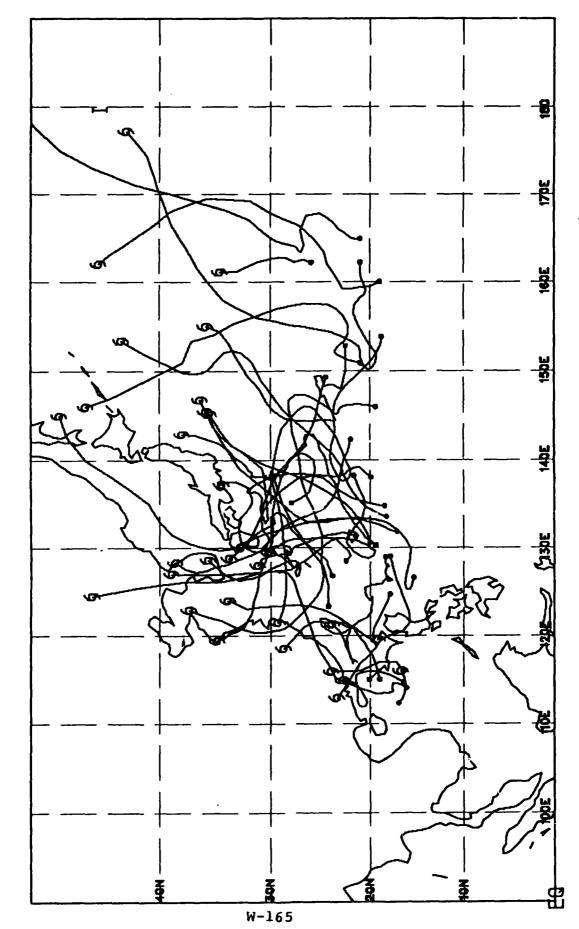
Actual path of recurving tropical cyclones (> 33 kts) developing at or north of 15°N.



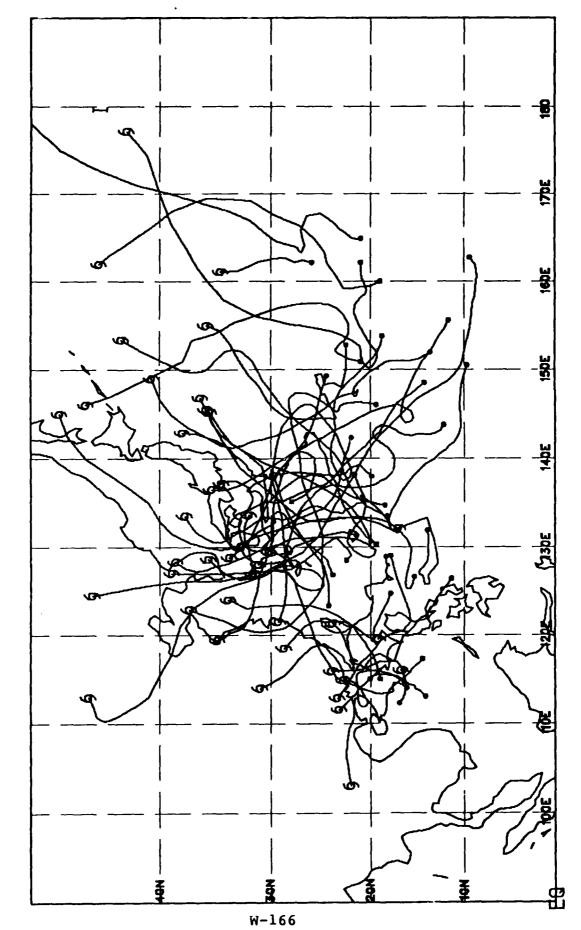
Actual path of all recurving tropical cyclones (> 33 kts).



Actual path of other tropical cyclones (> 33 kts) developing south of 15°N.



Actual path of other tropical cyclones (> 33 kts) developing at or north of 150N.



Actual path of all other tropical cyclones (> 33 kts).

CONSTANCY AND RELATIVE FREQUENCY FOR JUL 9 - JUL 23

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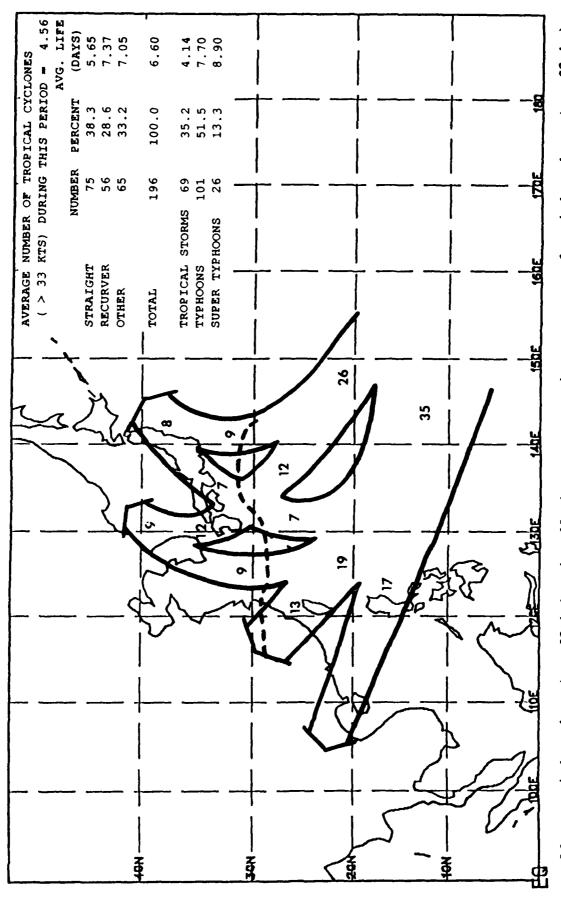
Tropical cyclone (>33 kts) Constancy (top number) and Relative Frequency (bottom number). Constancy is defined as the 12-hr average vector speed divided by the 12-hr average scalar speed. Relative Frequency is the number of tropical cyclones passing through the $5^{\rm O}$ latitude by $5^{\rm O}$ longitude square per year per time period.

SPEED OF MOVEMENT FOR JUL 9 - JUL 23

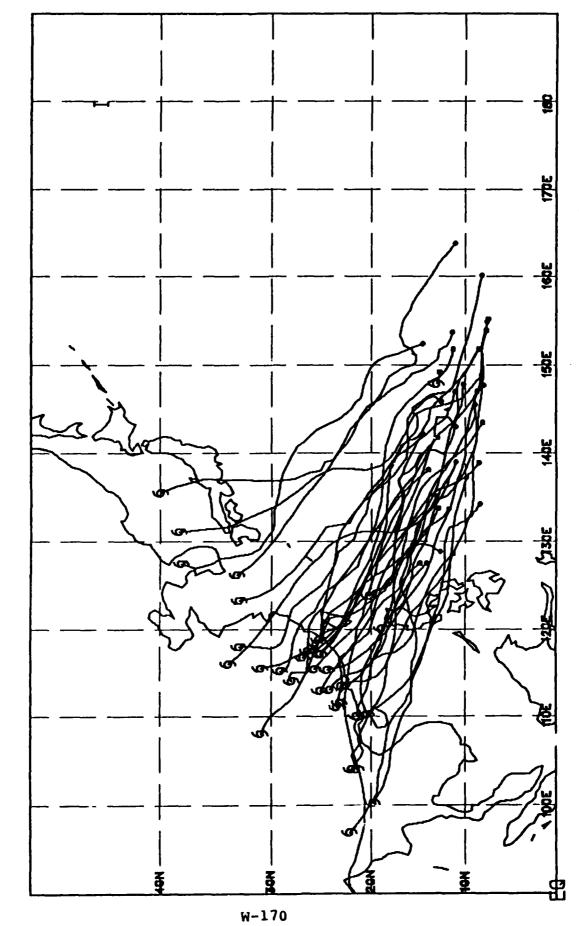
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Average tropical cyclone (> 33 kts) Speed (top number) in knots and sample size (bottom number) for each 5° latitude by 5° longitude square. Contours are drawn only to those squares containing at least 5% of the sample.

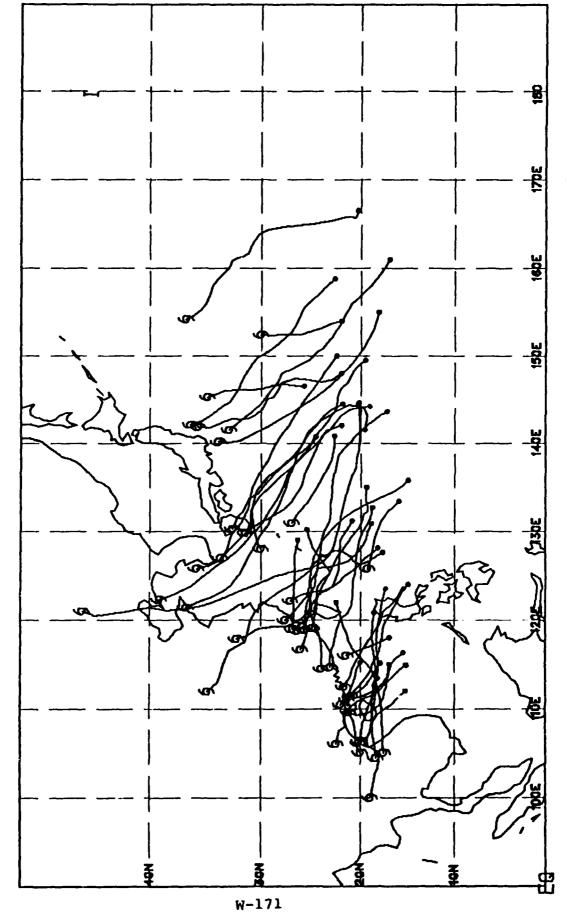
MEAN PATHS FOR JUL 24 - AUG 8



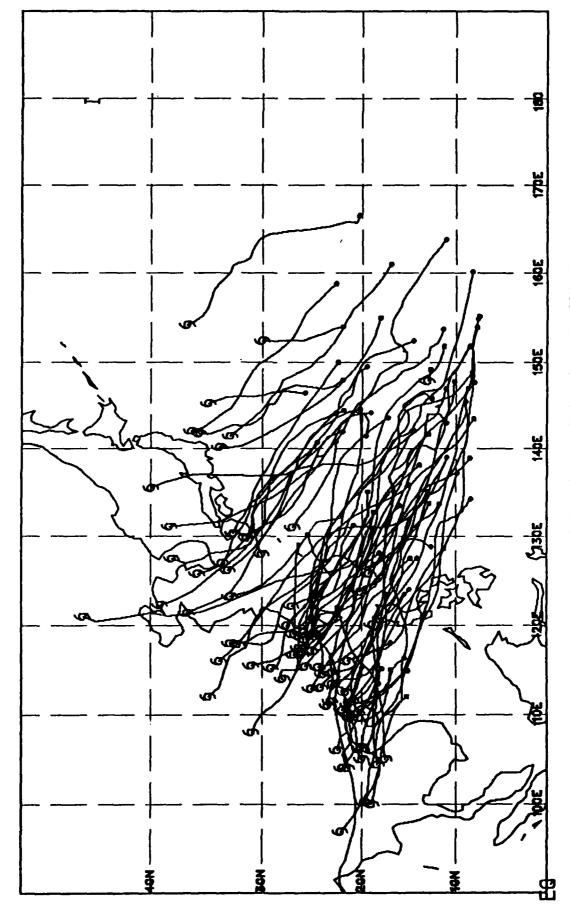
Dashed line represents mean recurvature position of cyclones 33 kts) Tracks which contained less than of tropical cyclones (> all tropical 100% since not percentage along a path. 2 add may not represent path and some develop/dissipate > 33 kts) are ignored. Numbers numbers tropical cyclones (> 33 kts) classified as recurvers. These 33 kts) path. 5% of the tropical cyclones followed the indicated a mean cyclone (> > 33 kts) follow tropical which Mean



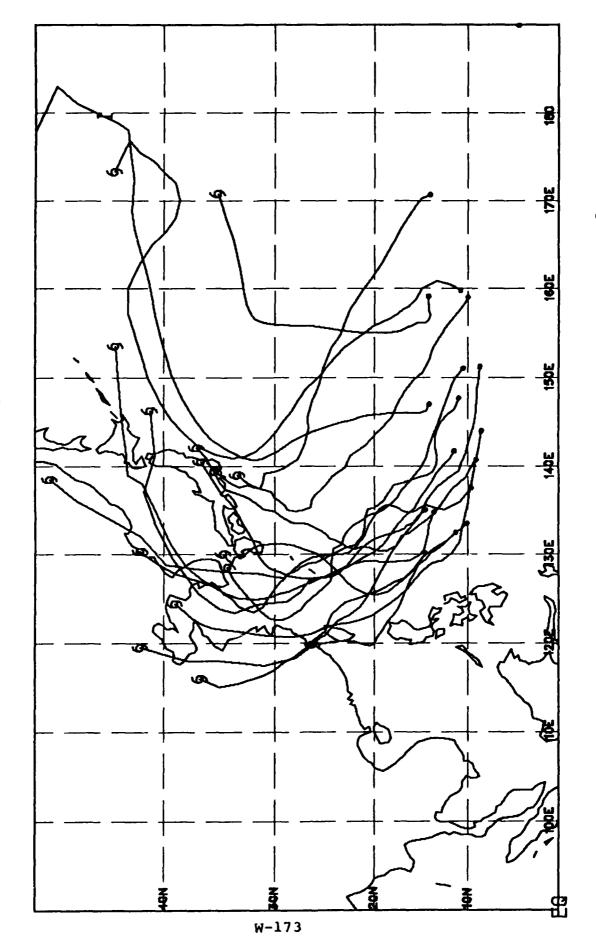
Actual path of straight tropical cyclones (> 33 kts) developing south of 15°N.



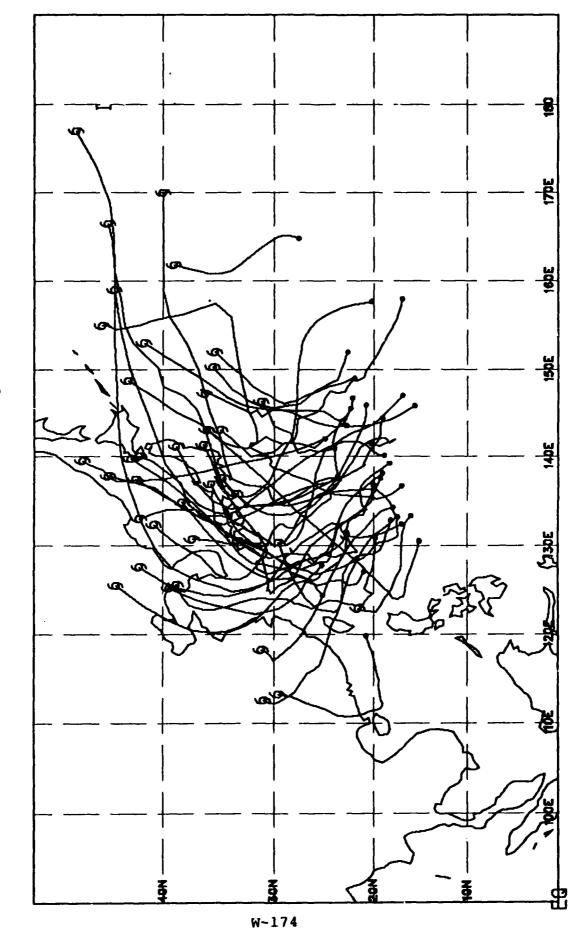
Actual path of straight tropical cyclones (> 33 kts) developing at or north of 15°N.



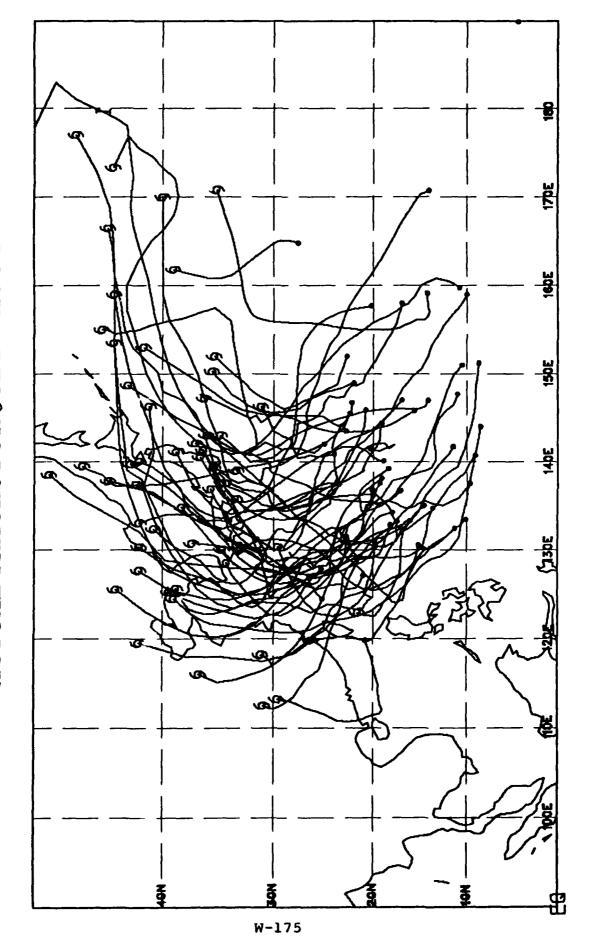
Actual path of all straight tropical cyclones (> 33 kts).



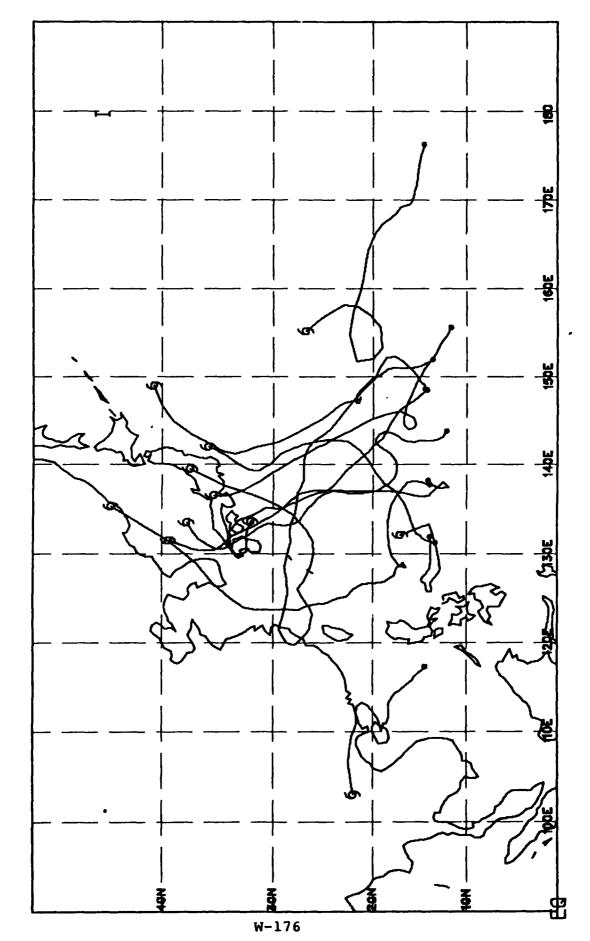
Actual path of recurving tropical cyclones (> 33 kts) developing south of 15°N.



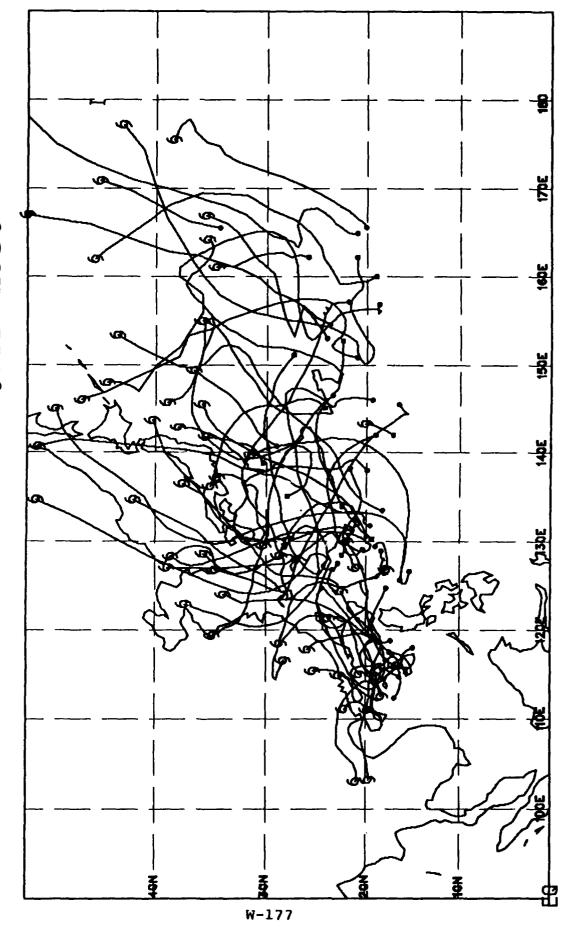
Actual path of recurving tropical cyclones (> 33 kts) developing at or north of 15°N.



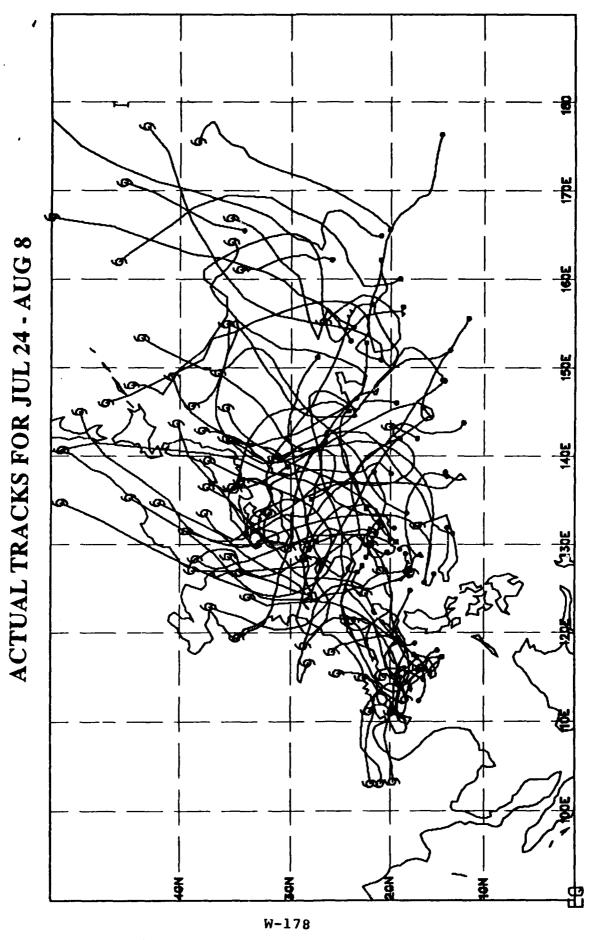
Actual path of all recurving tropical cyclones (> 33 kts).



Actual path of other tropical cyclones (> 33 kts) developing south of 15°N.



Actual path of other tropical cyclones (>33 kts) developing at or north of 15°N.



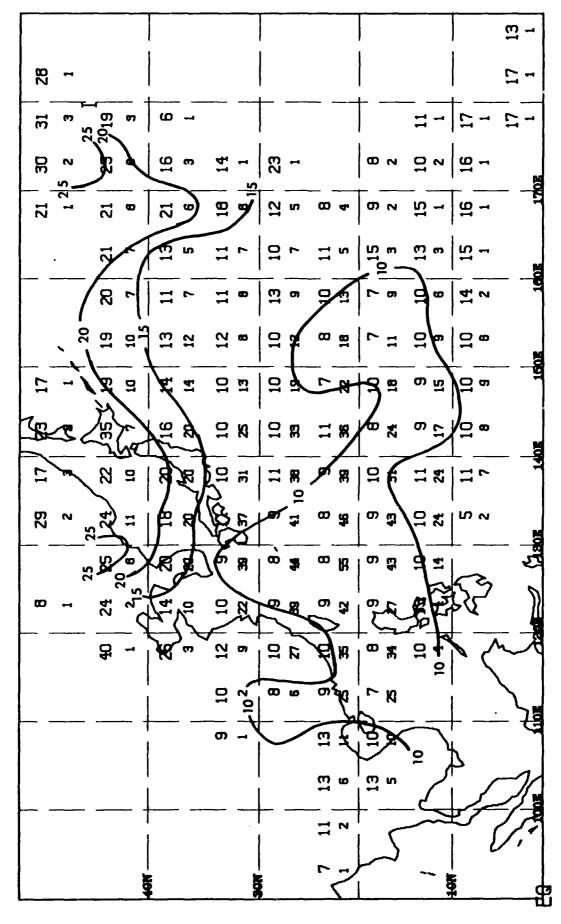
Actual path of all other tropical cyclones (>33 kts).

CONSTANCY AND RELATIVE FREQUENCY FOR JUL 24 - AUG 8

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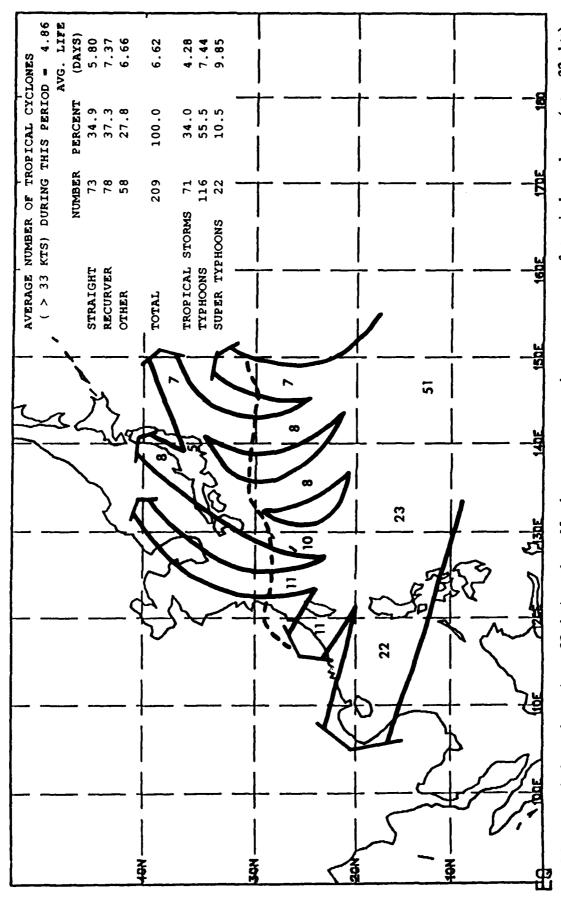
Tropical cyclone (> 33 kts) Constancy (top number) and Relative Frequency (bottom number). Constancy is defined as the 12-hr average vector speed divided by the 12-hr average scalar speed. Relative Frequency is the number of tropical cyclones passing through the 50 latitude by 50 longitude square per year per time period.

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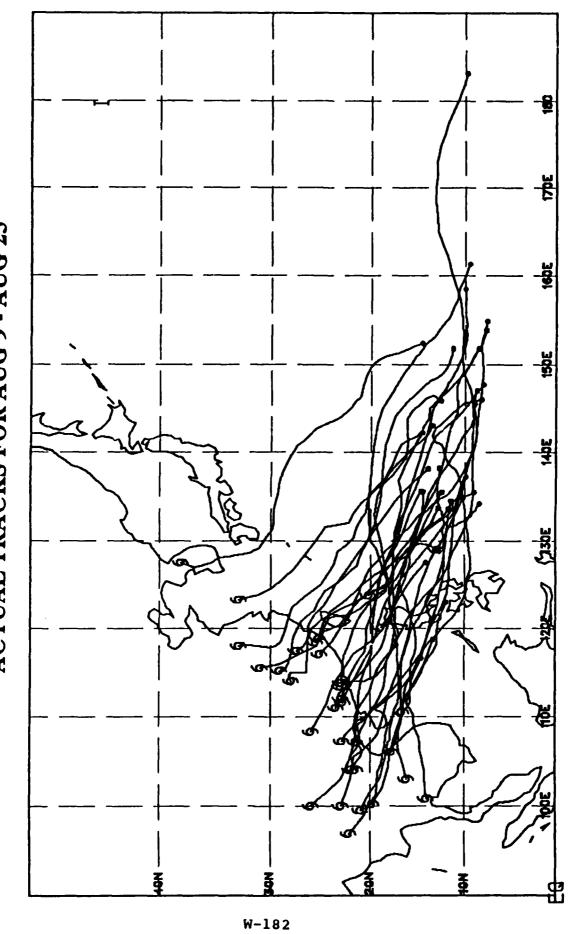


(> 33 kts) Speed (top number) in knots and sample size (bottom number) for longitude square. Contours are drawn only to those squares containing at Average tropical cyclone each 50 latitude by 50 least 5% of the sample.

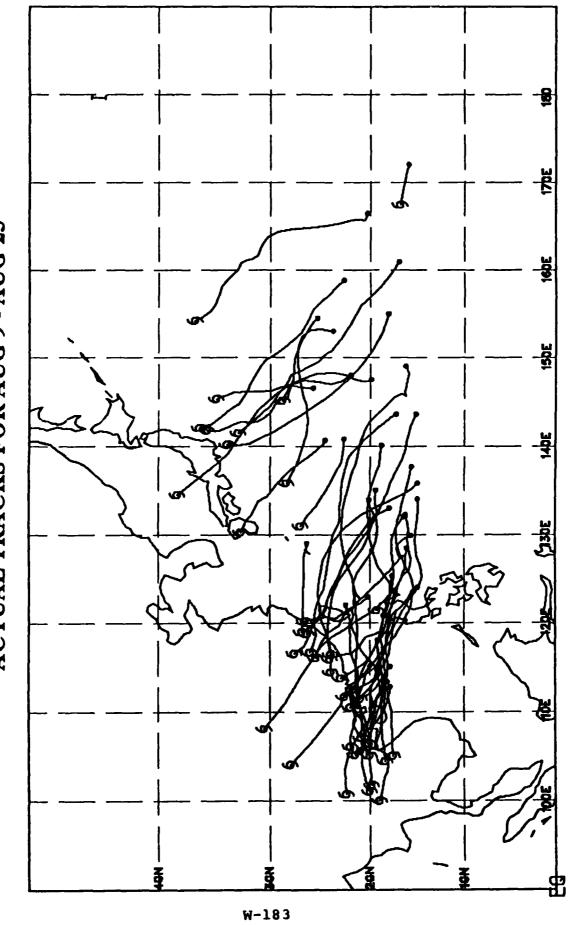
MEAN PATHS FOR AUG 9 - AUG 23



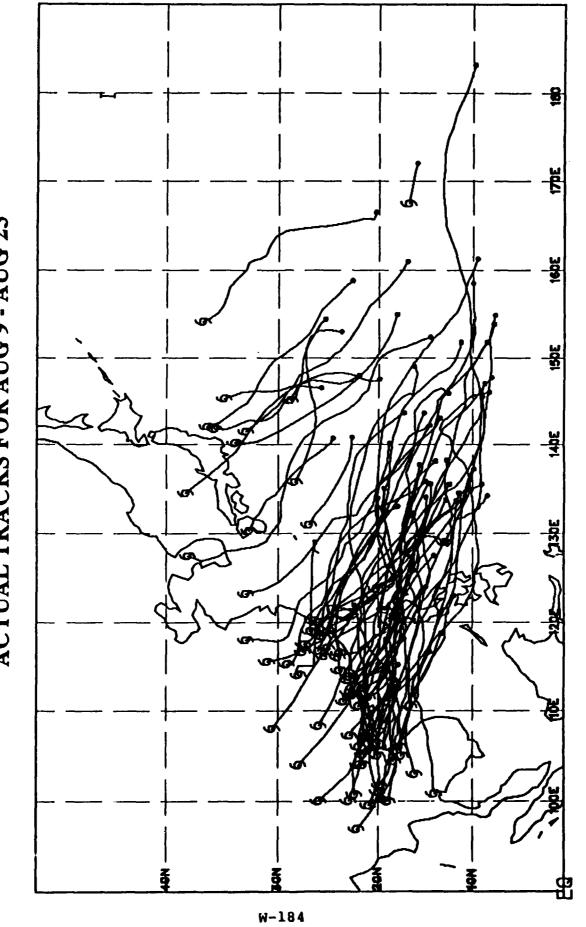
Dashed line represents mean recurvature position of cyclones percentage of tropical cyclones (> up to 100% since not all tropical Tracks which contained along a path. add represent may not develop/dissipate 33 kts) are ignored. Numbers numbers tropical cyclones (> 33 kts) classified as recurvers. and some These path. 33 kts) path cyclones followed the indicated a mean cyclone 33 kts) follow 5% of the tropical tropical which



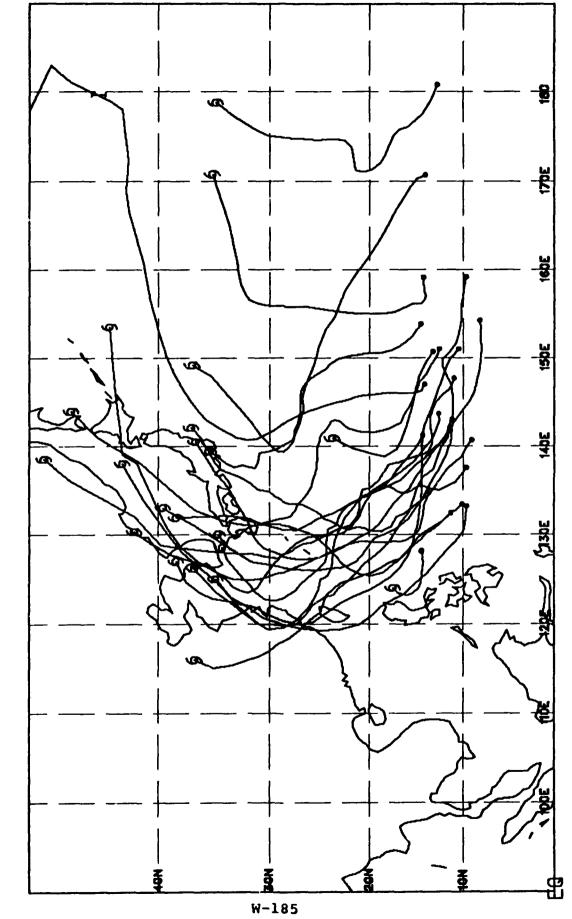
Actual path of straight tropical cyclones (> 33 kts) developing south of 15°N.



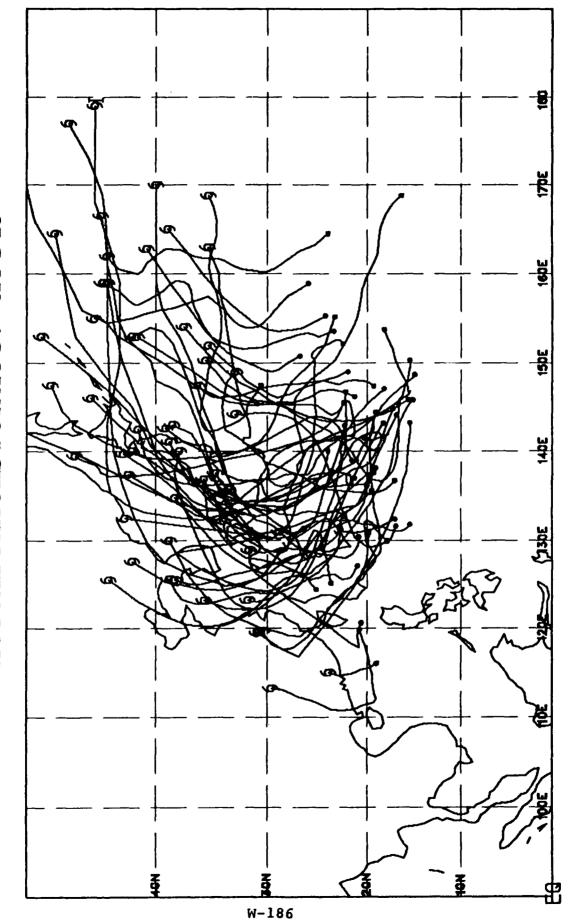
Actual path of straight tropical cyclones (> 33 kts) developing at or north of 15°N.



Actual path of all straight tropical cyclones (> 33 kts).

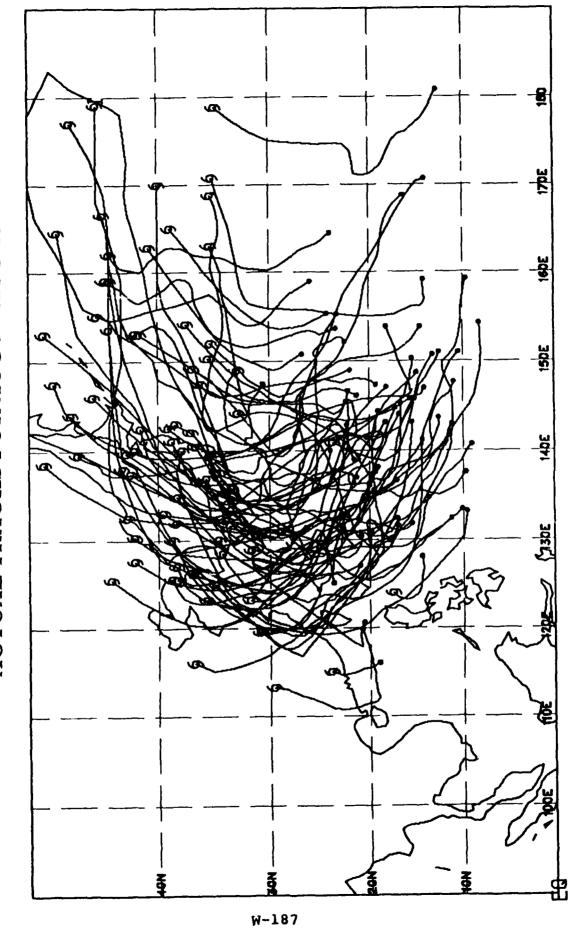


Actual path of recurving tropical cyclones (> 33 kts) developing south of 150N.

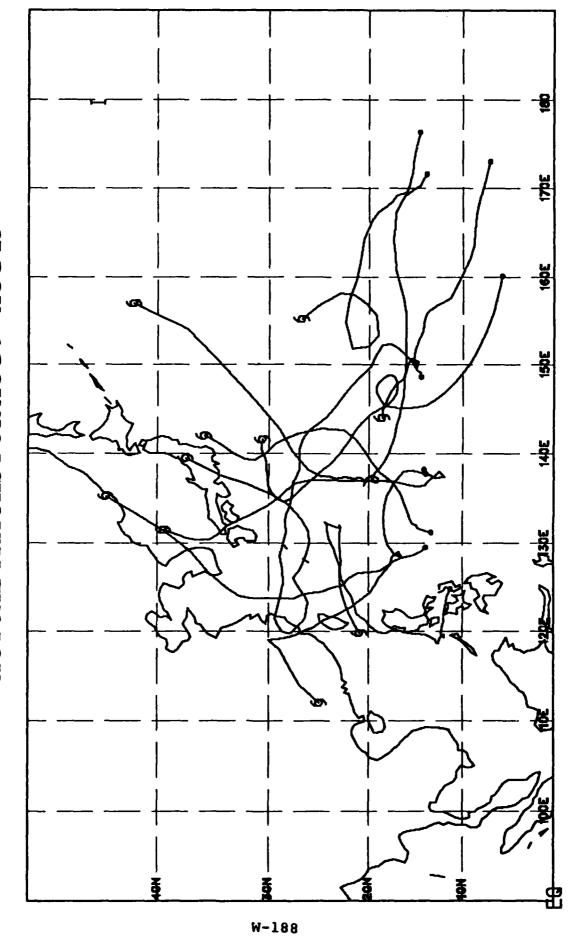


Actual path of recurving tropical cyclones (> 33 kts) developing at or north of 15°N.

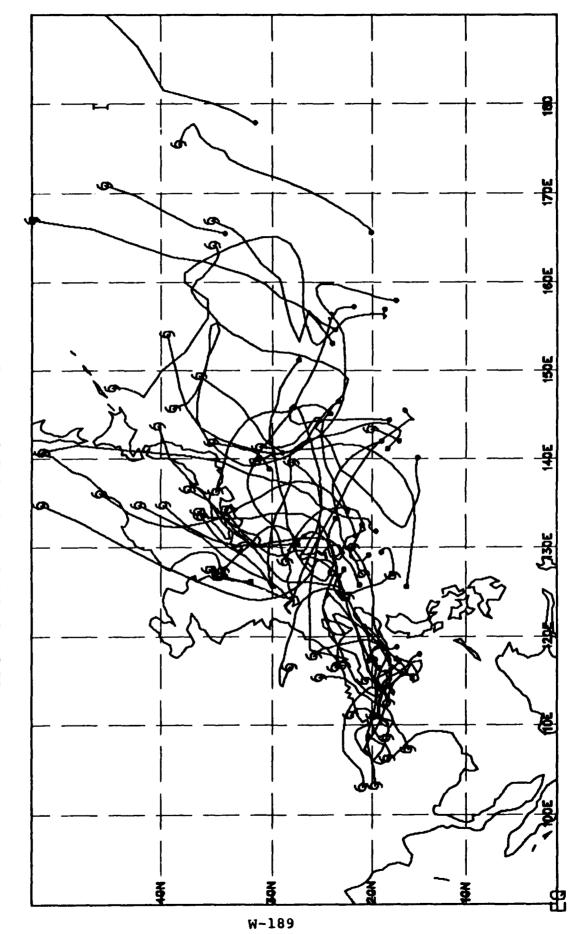
ACTUAL TRACKS FOR AUG 9 - AUG 23



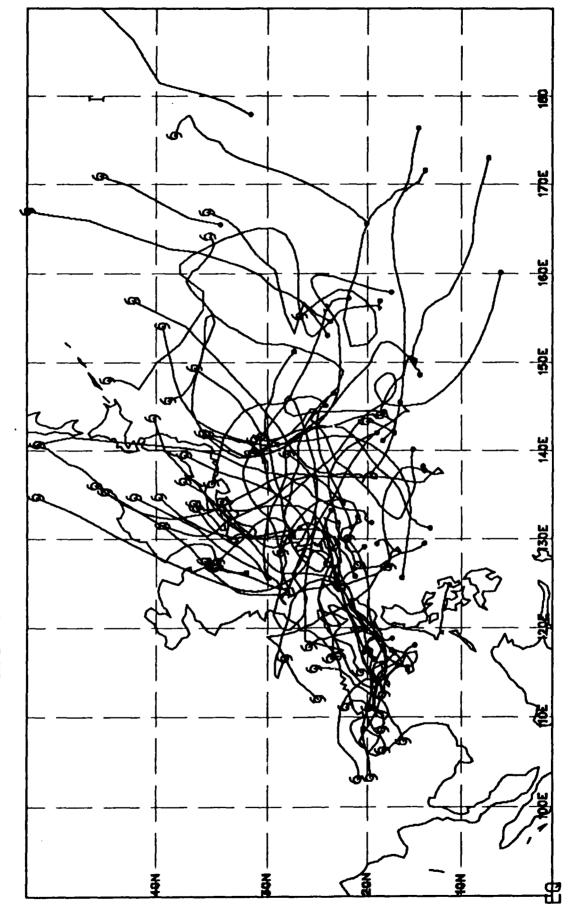
Actual path of all recurving tropical cyclones (> 33 kts).



Actual path of other tropical cyclones (>33 kts) developing south of 150N.



Actual path of other tropical cyclones (> 33 kts) developing at or north of 15°N.

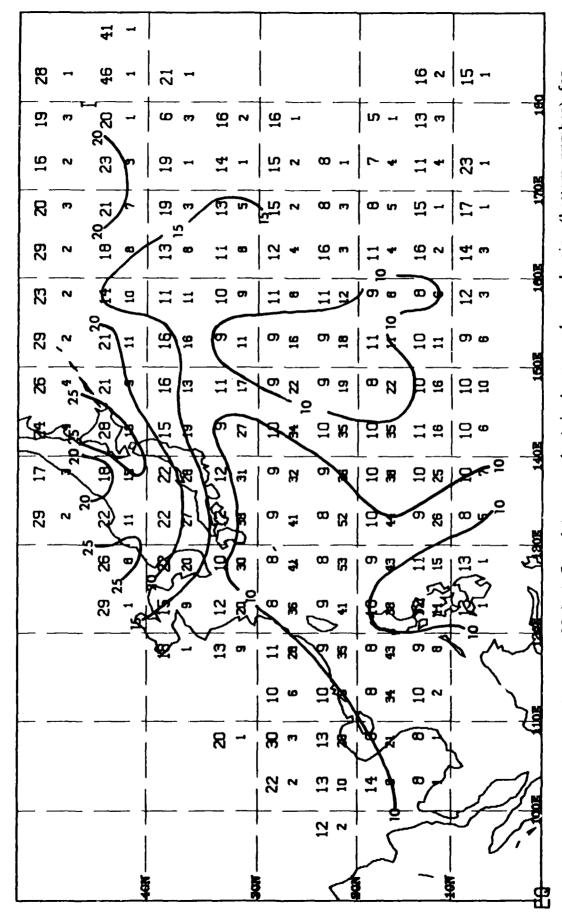


Actual path of all other tropical cyclones (> 33 kts).

CONSTANCY AND RELATIVE FREQUENCY FOR AUG 9 - AUG 23

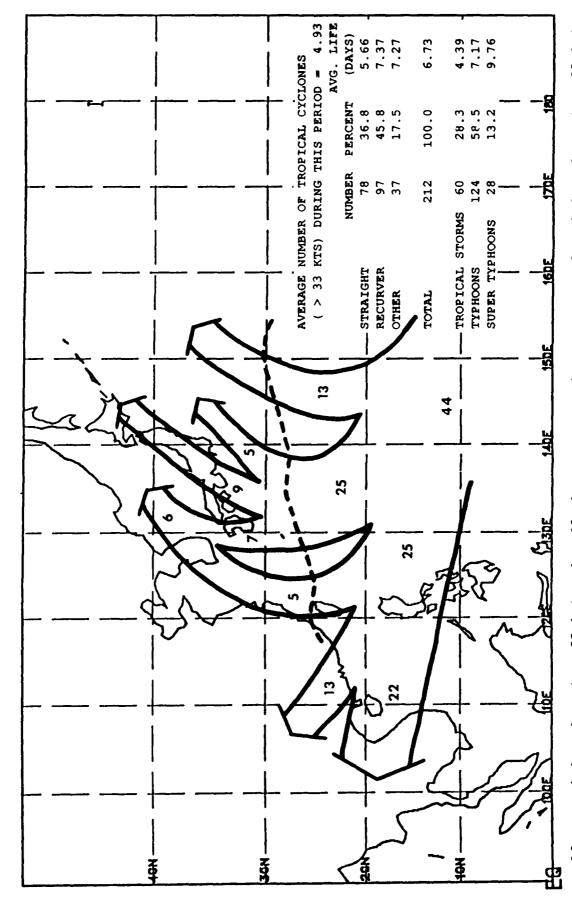
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Tropical cyclone (> 33 kts) Constancy (top number) and Relative Frequency (bottom number). Constancy is defined as the 12-hr average vector speed divided by the 12-hr average, scalar speed. Relative Frequency is the number of tropical cyclones passing through the 50 latitude by 50 longitude square per year per time period.

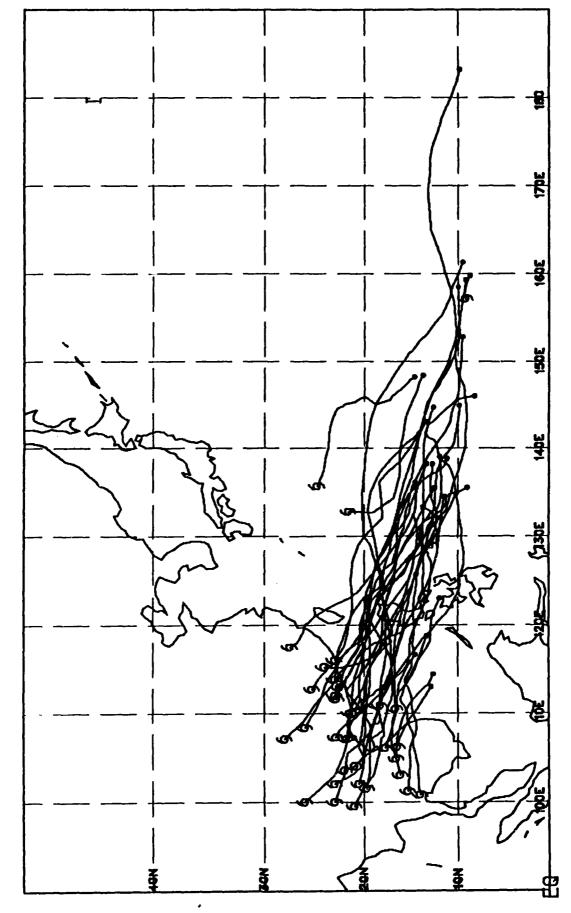


(> 33 kts) Speed (top number) in knots and sample size (bottom number) for longitude square. Contours are drawn only to those squares containing at Average tropical cyclone each 50 latitude by 50 least 5% of the sample.

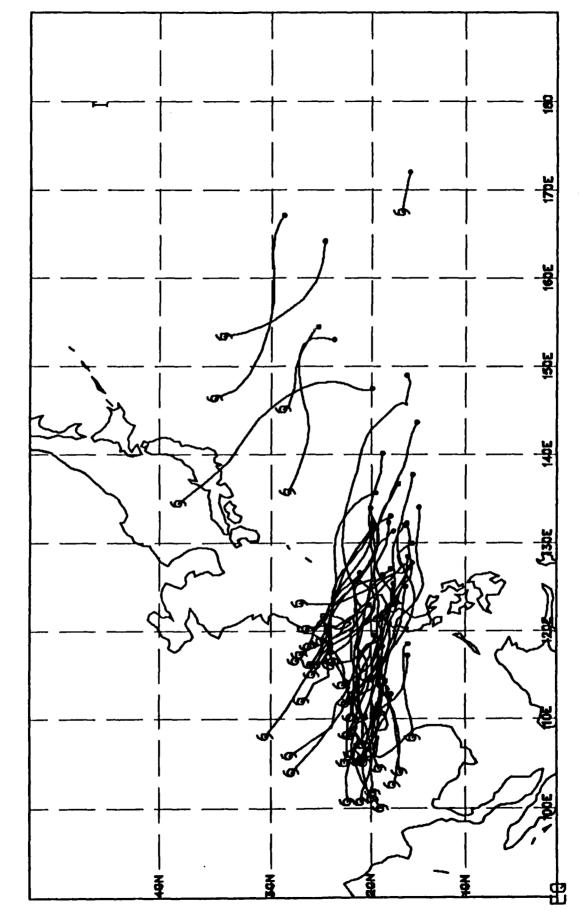
MEAN PATHS FOR AUG 24 - SEP 8



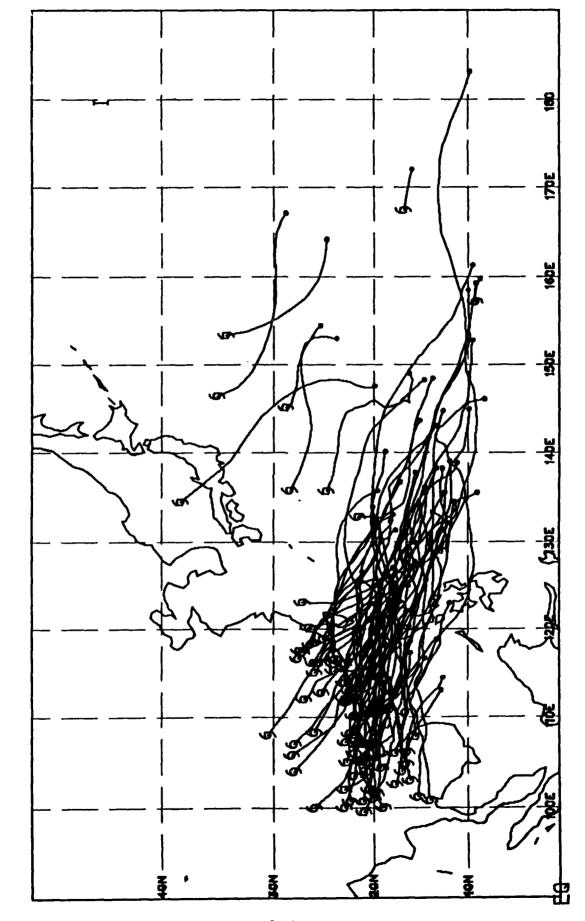
Dashed line represents mean recurvature position of cyclones Tracks which contained less than of tropical cyclones (> to 100% since not all tropical percentage along a path. add represent may not and some develop/dissipate 33 kts) are ignored. Numbers numbers tropical cyclones (> 33 kts) classified as recurvers. These oath. 33 kts) path. path cyclones which followed the indicated a mean cyclone (> 33 kts) follow 5% of the tropical tropical Mean



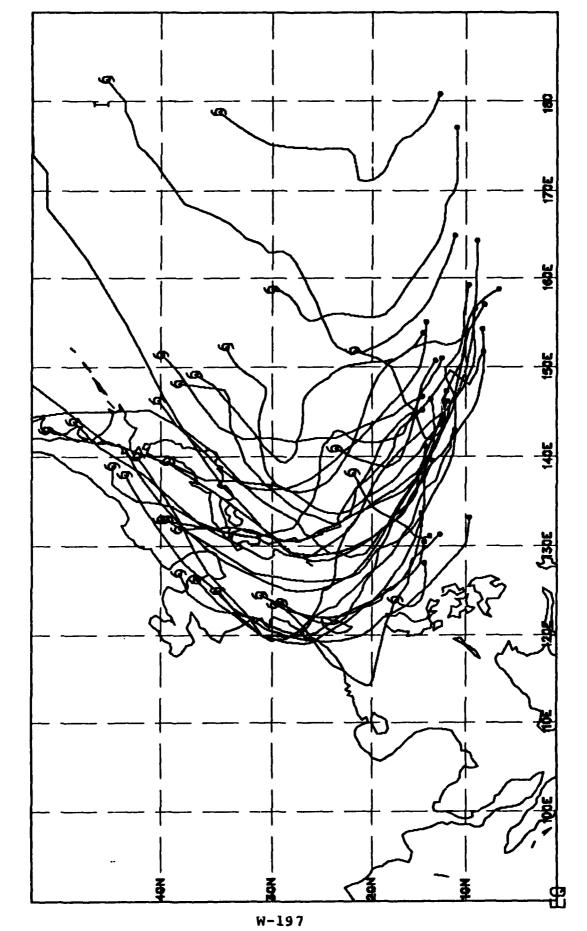
Actual path of straight tropical cyclones (> 33 kts) developing south of 15°N.



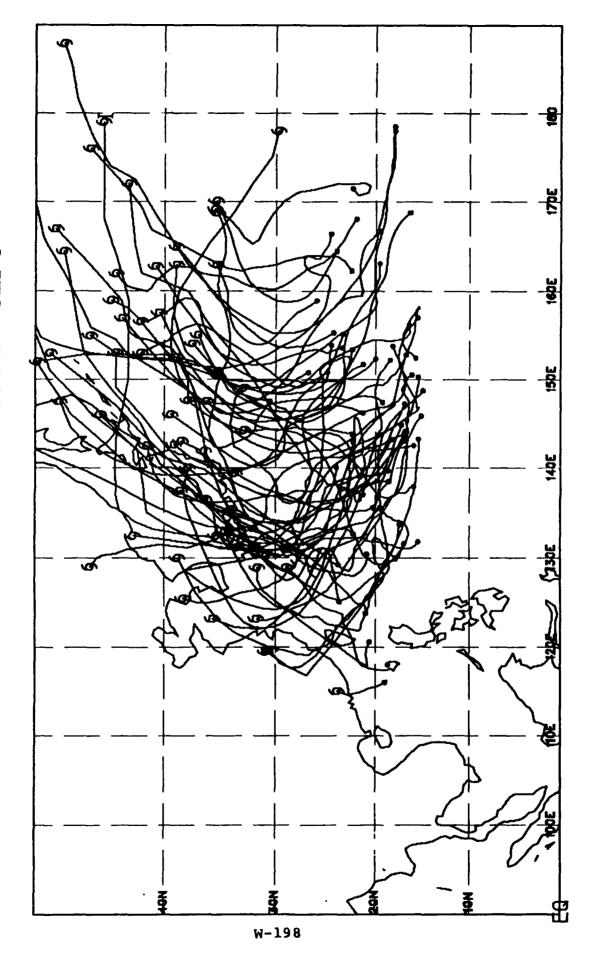
Actual path of straight tropical cyclones (> 33 kts) developing at or north of 15°N.



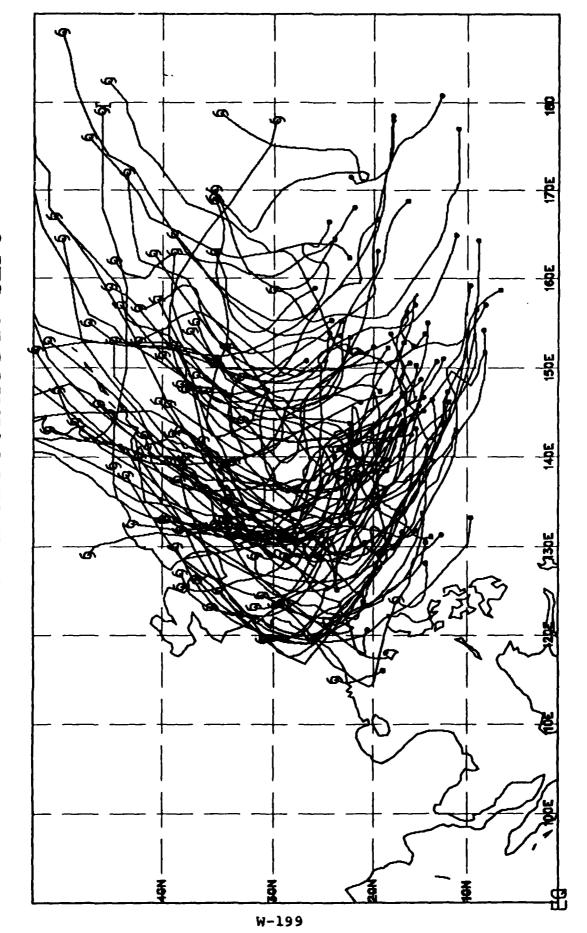
Actual path of all straight tropical cyclones (> 33 kts).



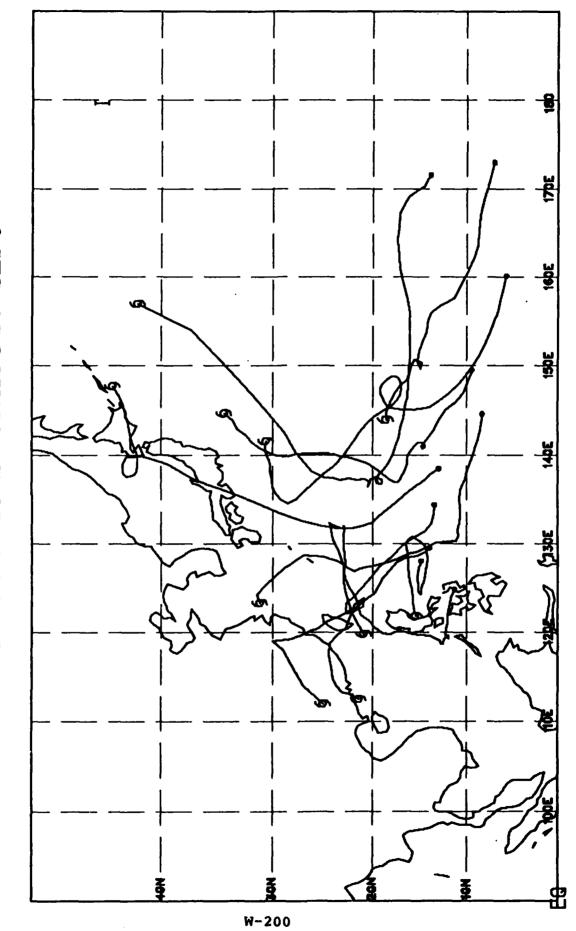
Actual path of recurving tropical cyclones (> 33 kts) developing south of 15°N.



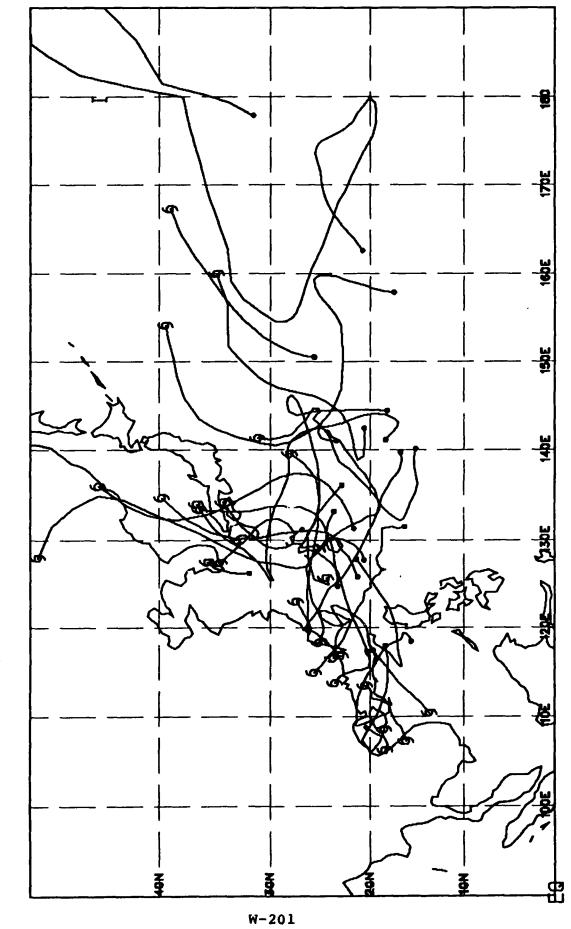
Actual path of recurving tropical cyclones (> 33 kts) developing at or north of 15°N.



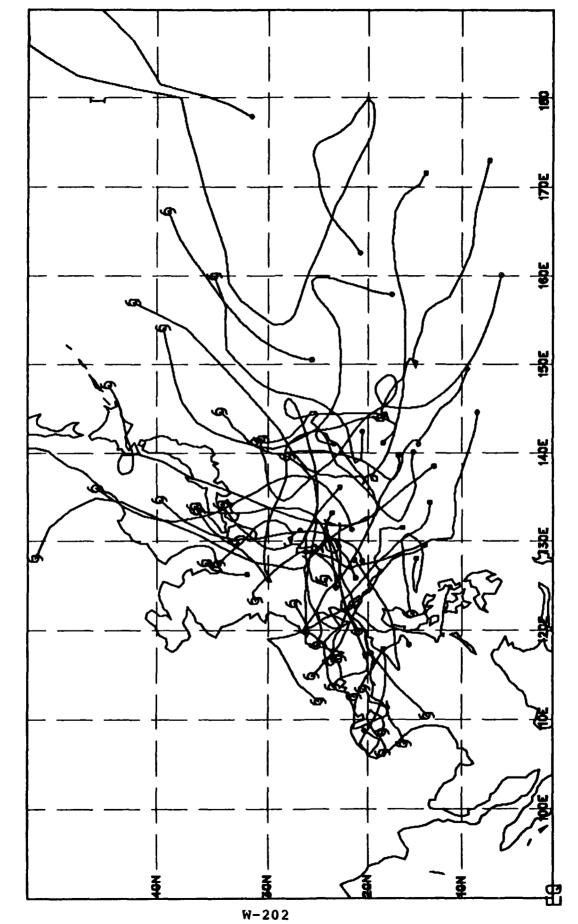
Actual path of all recurving tropical cyclones (> 33 kts).



Actual path of other tropical cyclones (>33 kts) developing south of 15°N.



Actual path of other tropical cyclones (> 33 kts) developing at or north of 15°N.



Actual path of all other tropical cyclones (>33 kts).

CONSTANCY AND RELATIVE FREQUENCY FOR AUG 24 - SEP 8

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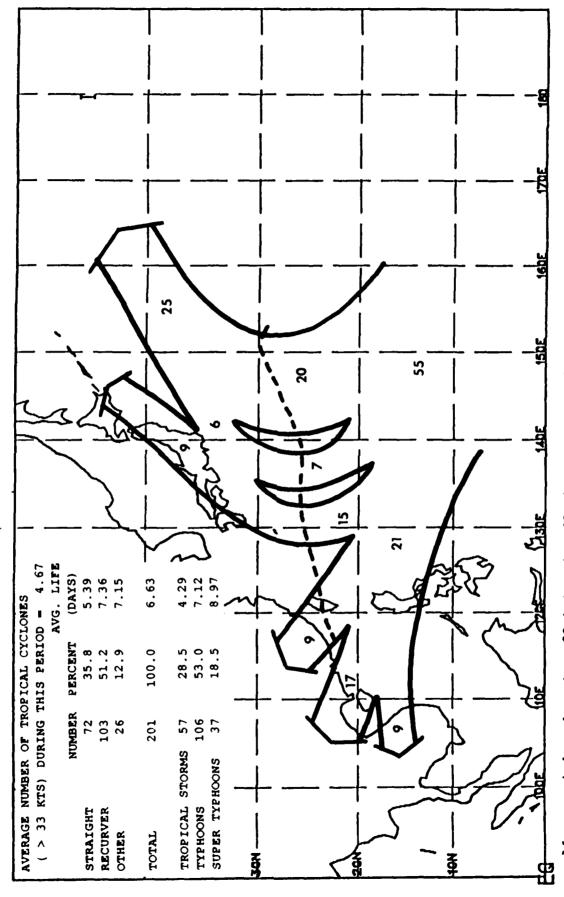
Tropical cyclone (> 33 kts) Constancy (top number) and Relative Frequency (bottom number). Constancy is defined as the 12-hr average vector speed divided by the 12-hr average scalar speed. Relative Frequency is the number of tropical cyclones passing through the 5° latitude by 5° longitude square per year per time period.

SPEED OF MOVEMENT FOR AUG 24 - SEP 8

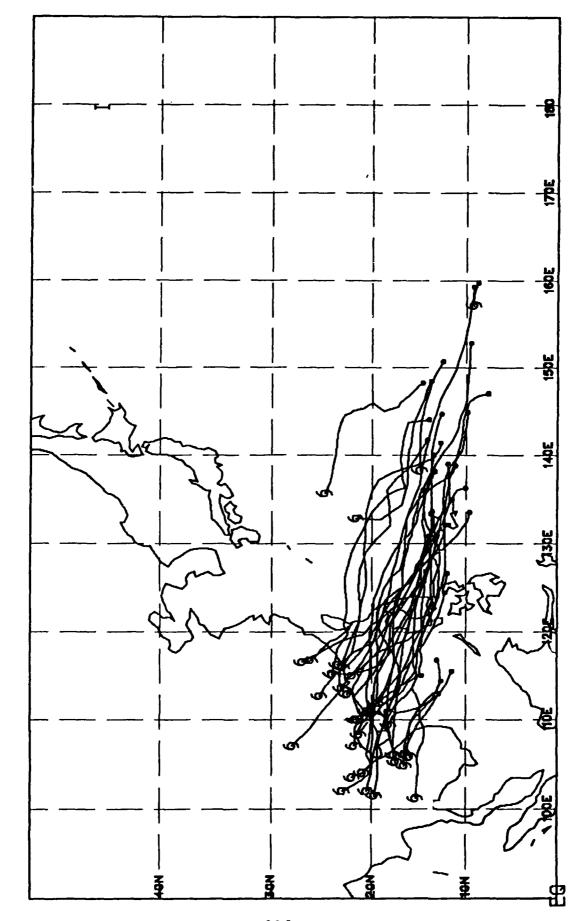
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Average tropical cyclone (> 33 kts) Speed (top number) in knots and sample size (bottom number) for each 5° latitude by 5° longitude square. Contours are drawn only to those squares containing at least 5% of the sample.

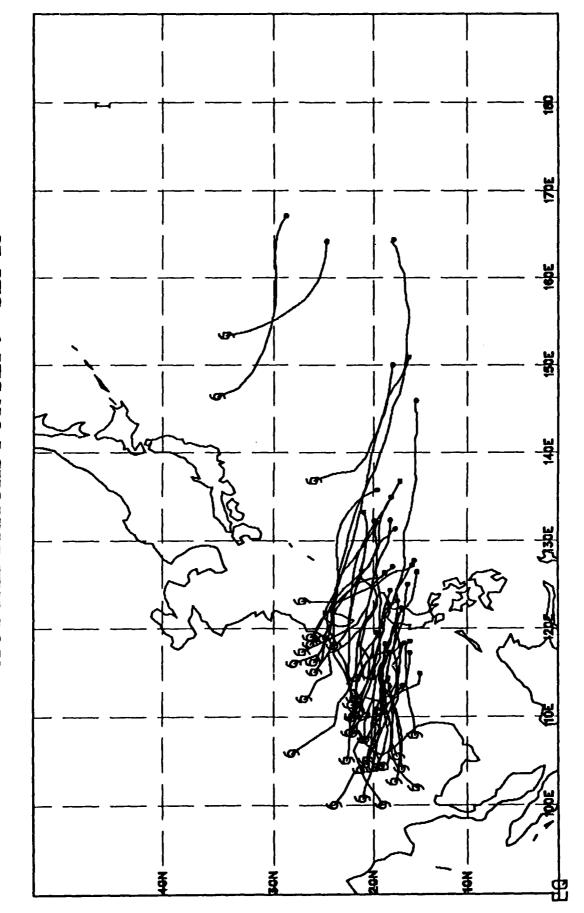
MEAN PATHS FOR SEP 9 - SEP 23



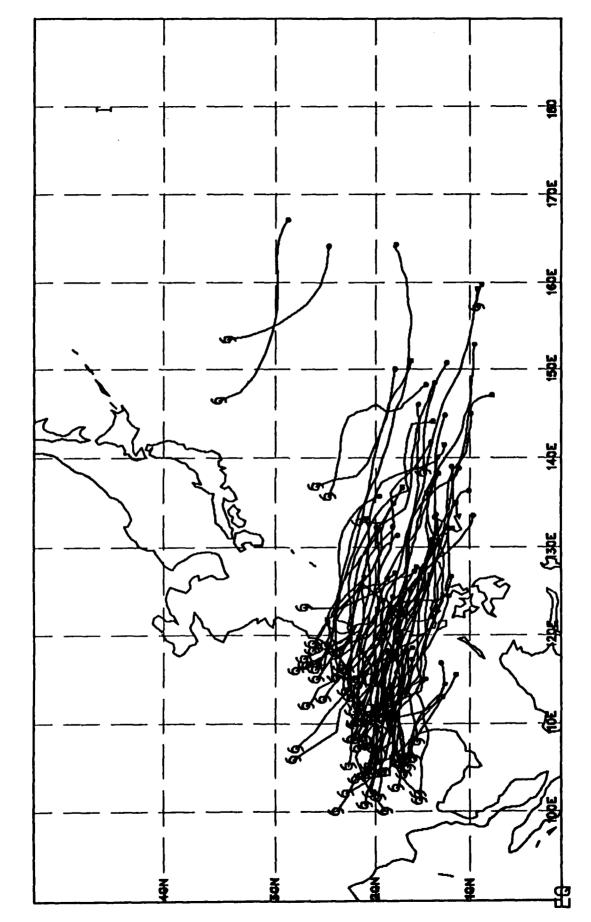
Dashed line represents mean recurvature position of cyclones Tracks which contained less than 33 km) the percentage of tropical cyclones (> add up to 100% since not all tropical along a path. Numbers represent may not and some develop/dissipate > 33 kts) are ignored. numbers tropical cyclones (> 33 kts) classified as recurvers. These 33 kts) path. path. path cyclones which followed the indicated 33 kts) follow a mean cyclone (> 5% of the tropical tropical



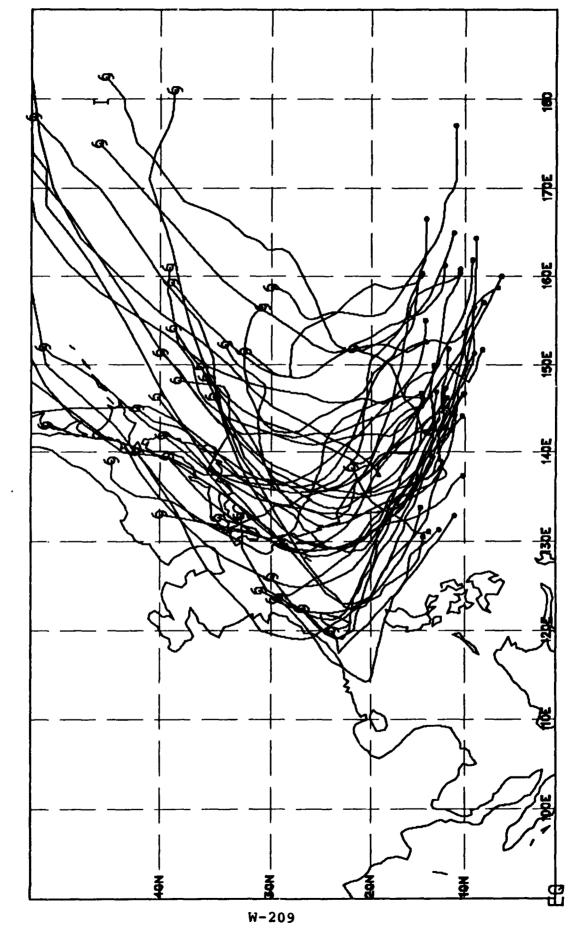
Actual path of straight tropical cyclones (> 33 kts) developing south of 15°N.



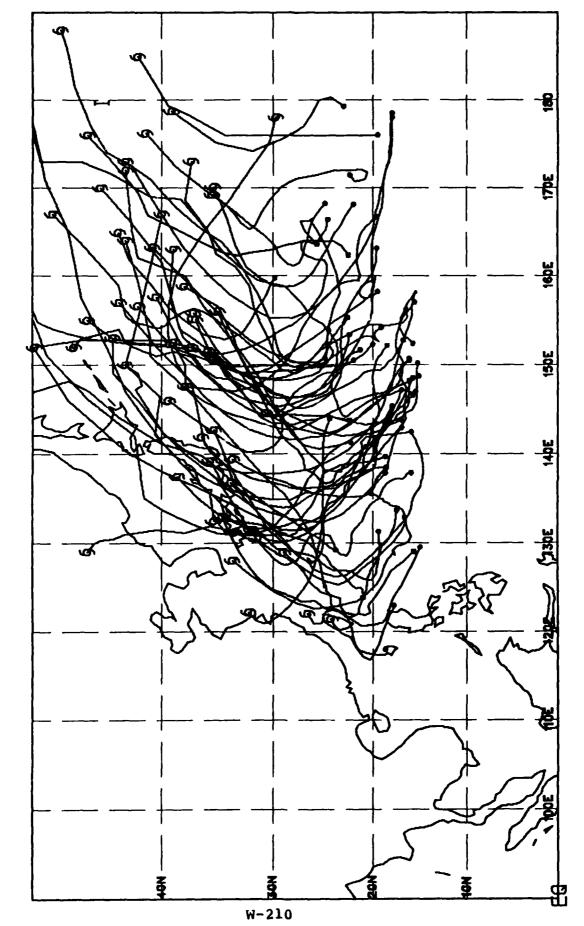
Actual path of straight tropical cyclones (> 33 kts) developing at or north of 15°N.



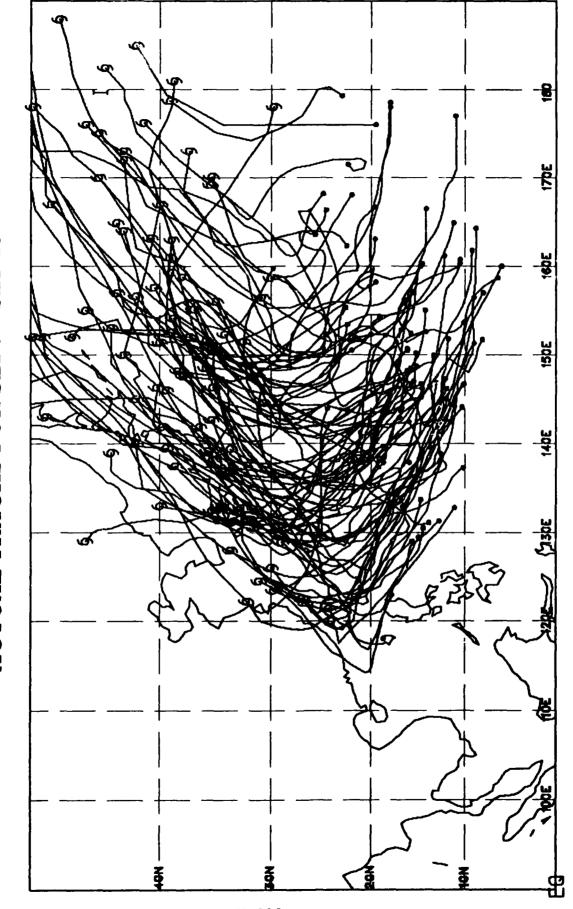
Actual path of all straight tropical cyclones (> 33 kts).



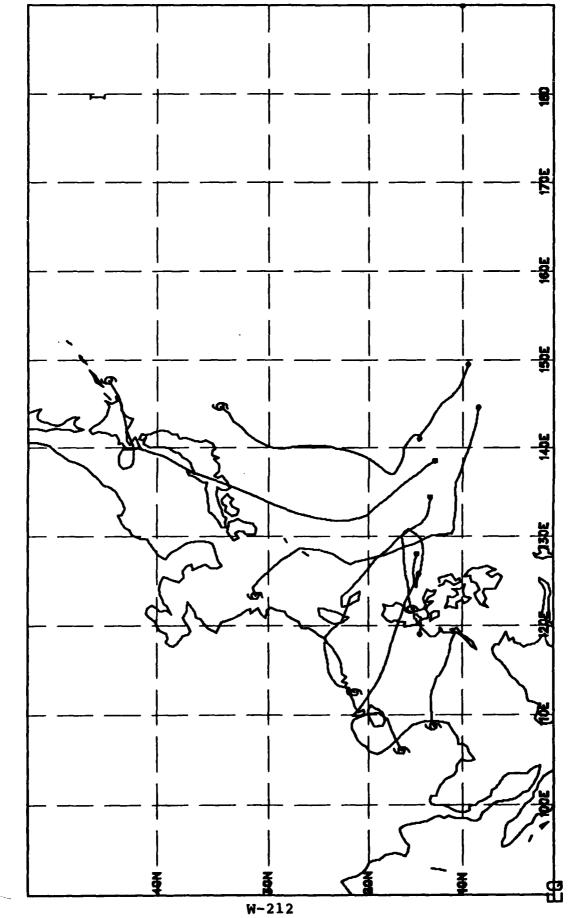
Actual path of recurving tropical cyclones (> 33 kts) developing south of 15°N.



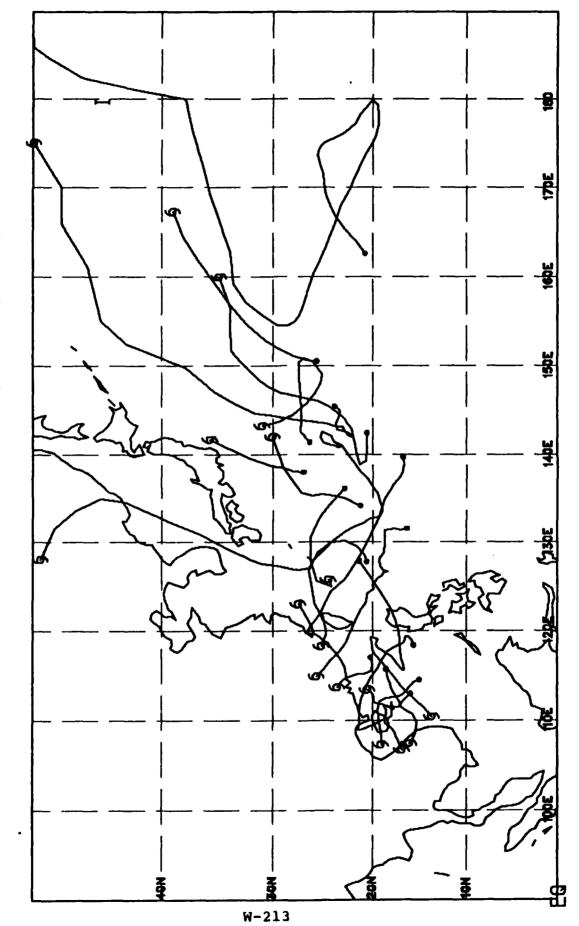
Actual path of recurving tropical cyclones (> 33 kts) developing at or north of 15°N.



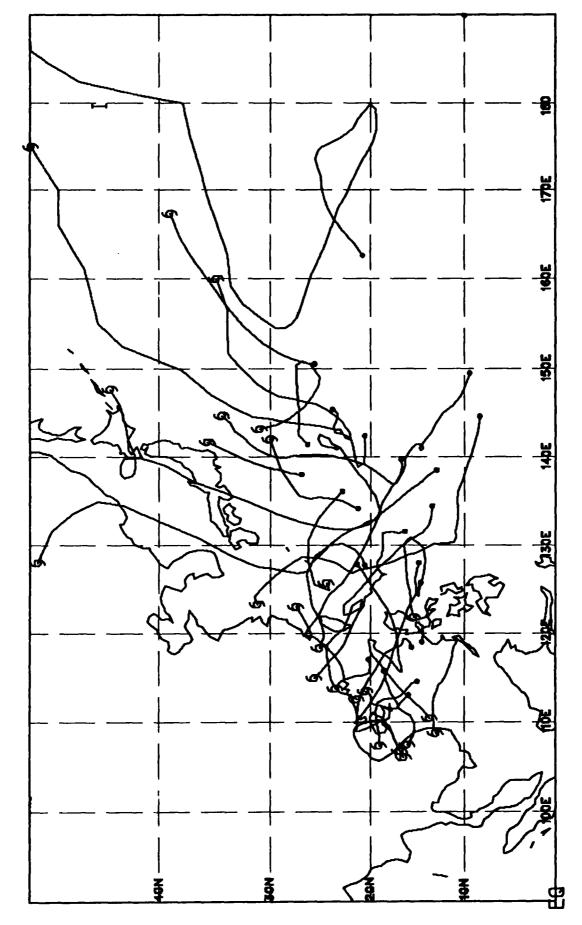
Actual path of all recurving tropical cyclones (> 33 kts).



Actual path of other tropical cyclones (> 33 kts) developing south of 15°N.



Actual path of other tropical cyclones (> 33 kts) developing at or north of 15°N.



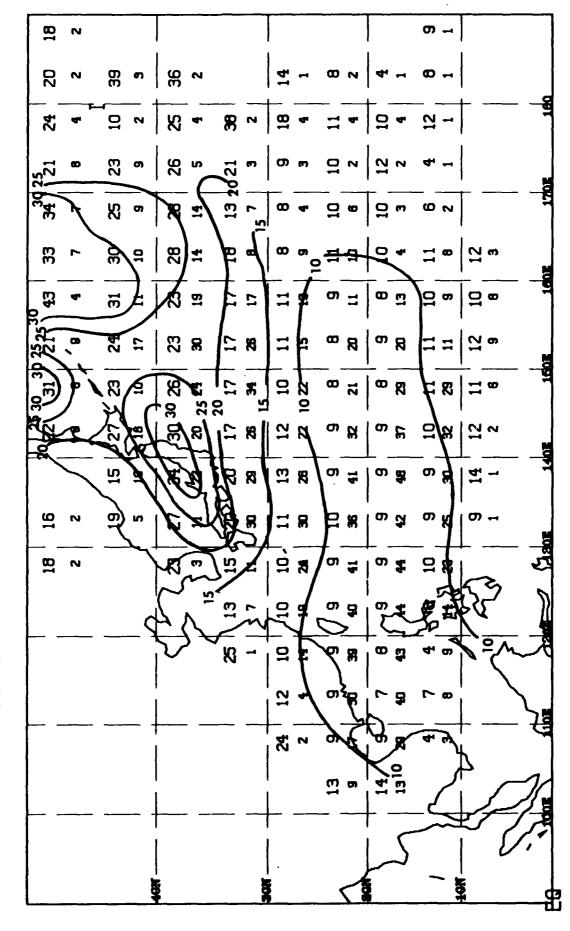
Actual path of all other tropical cyclones (> 33 krs).

CONSTANCY AND RELATIVE FREQUENCY FOR SEP 9 - SEP 23

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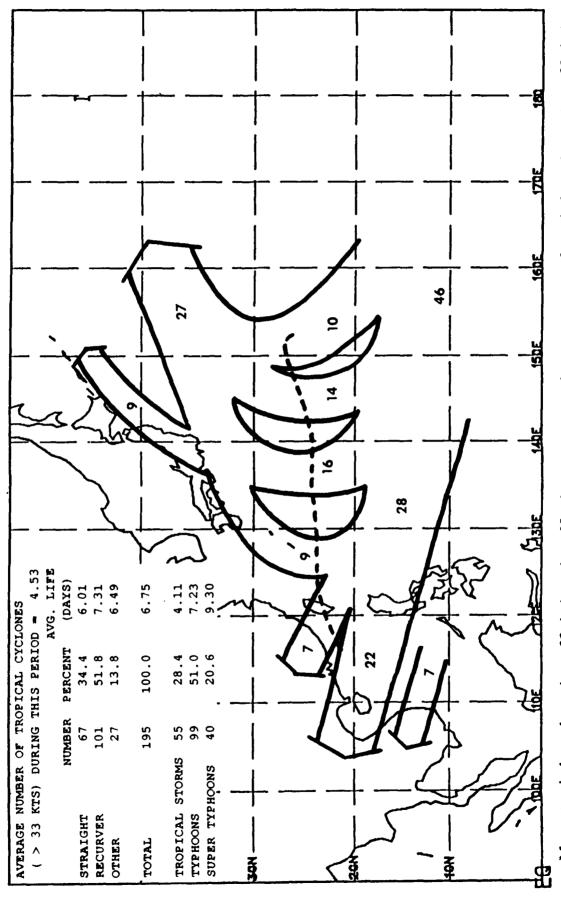
Tropical cyclone (> 33 kts) Constancy (top number) and Relative Frequency (bottom number). Constancy is defined as the 12-hr average vector speed divided by the 12-hr average scalar speed. Relative Frequency is the number of tropical cyclones passing through the 5^{0} latitude by 5^{0} longitude square per year per time period.

SPEED OF MOVEMENT FOR SEP 9 - SEP 23

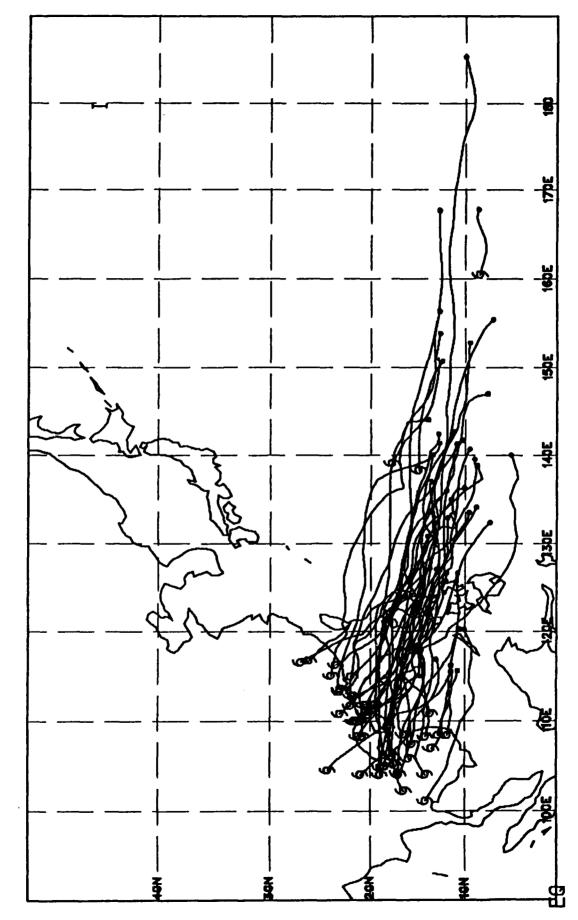


Average tropical cyclone (> 33 kts) Speed (top number) in knots and sample size (bottom number) for each 5° latitude by 5° longitude square. Contours are drawn only to those squares containing at least 5% of the sample.

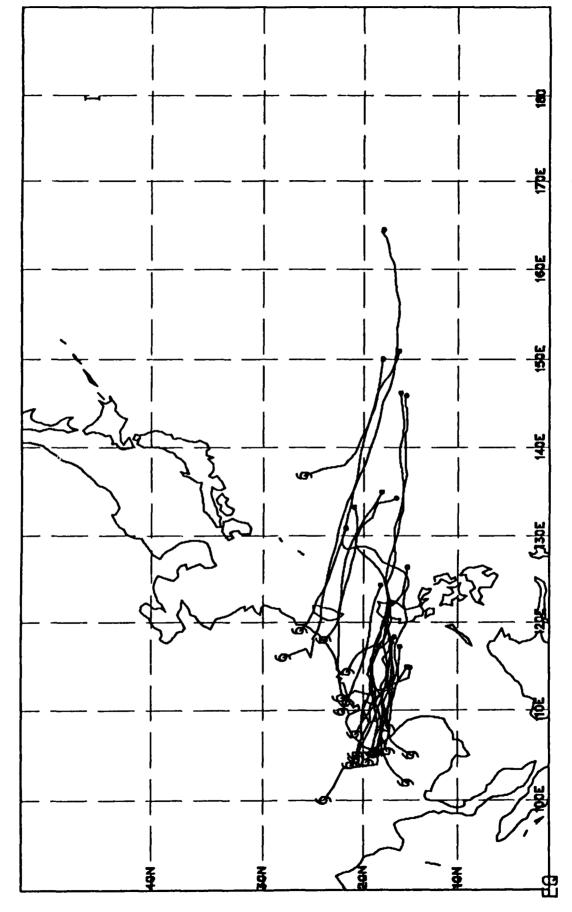
MEAN PATHS FOR SEP 24 - OCT 8



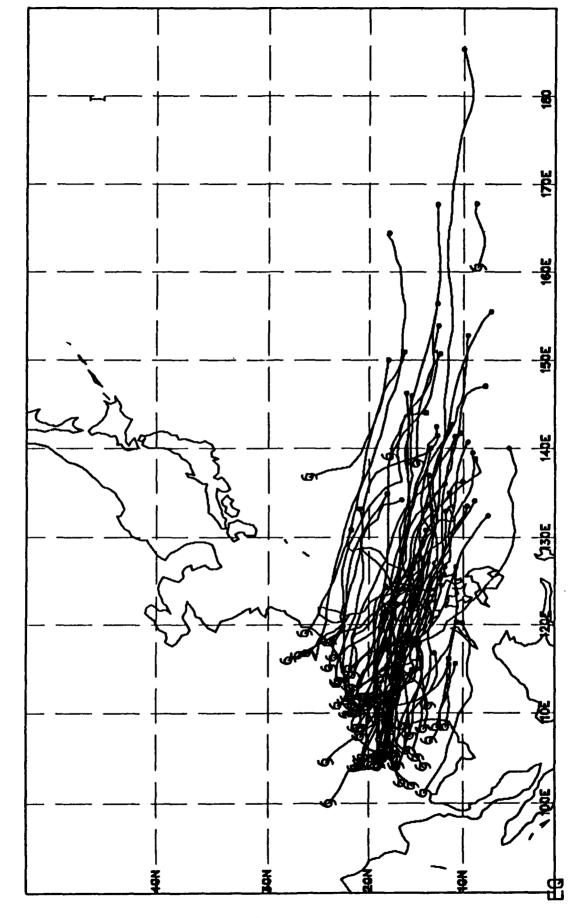
Dashed line represents mean recurvature position of 33 kts) cyclones Tracks which contained less than the percentage of tropical cyclones (> up to 100% since not all tropical along a path. Numbers represent may not and some develop/dissipate (> 33 kts) are ignored. numbers tropical cyclones (> 33 kts) classified as recurvers. These 33 kts) path. path. path cyclones which followed the indicated a mean tropical cyclone (> 33 kts) follow 5% of the tropical



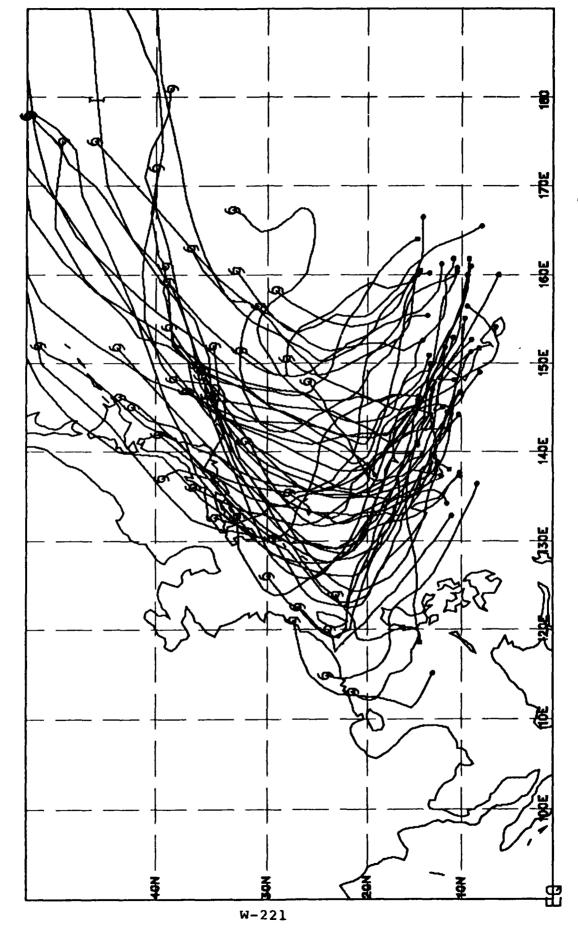
Actual path of straight tropical cyclones (> 33 kts) developing south of 15°N.



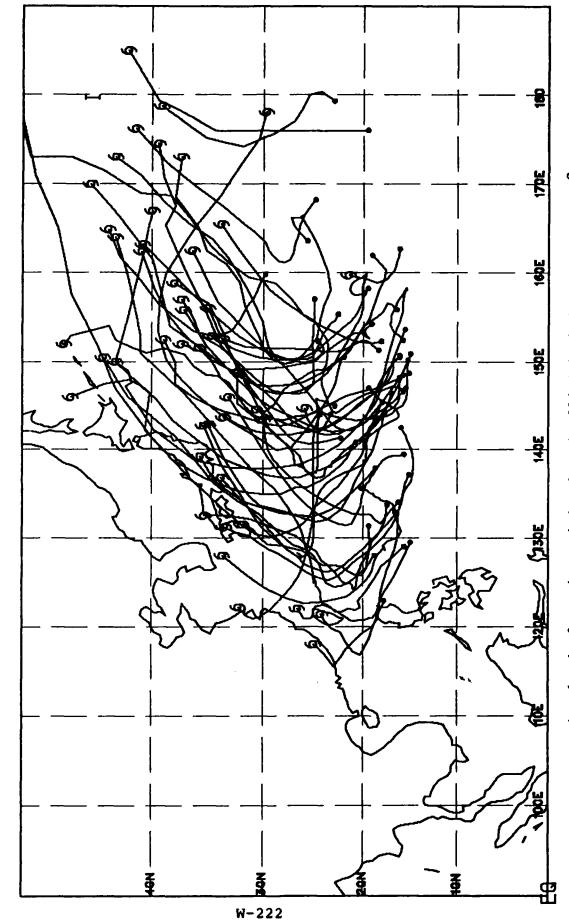
Actual path of straight tropical cyclones (> 33 kts) developing at or north of 15°N.



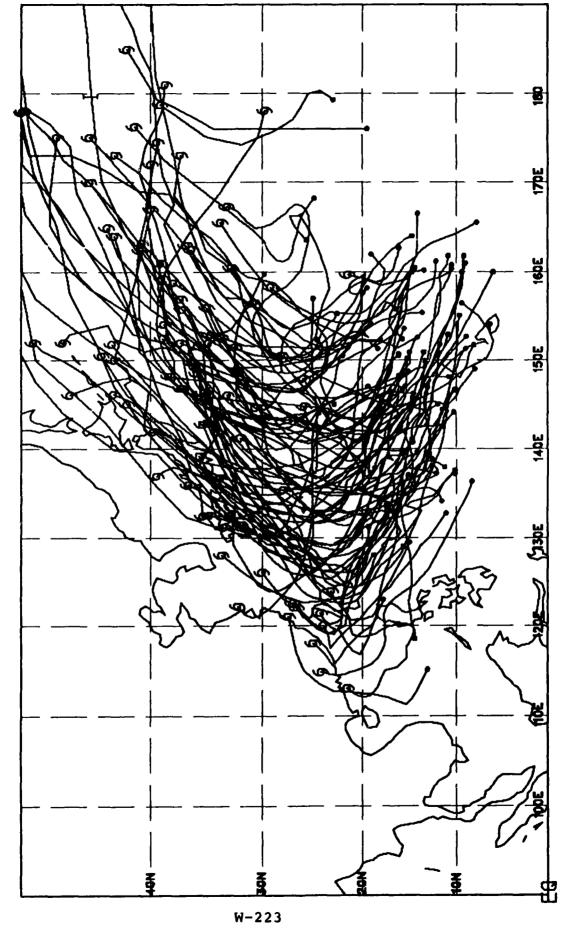
Actual path of all straight tropical cyclones (> 33 kts).



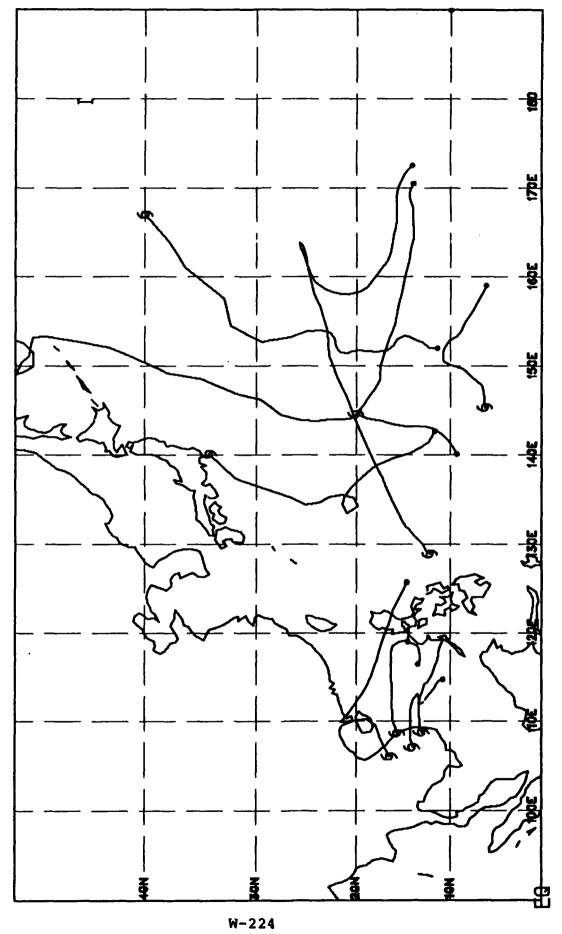
Actual path of recurving tropical cyclones (> 33 kts) developing south of 15°N.



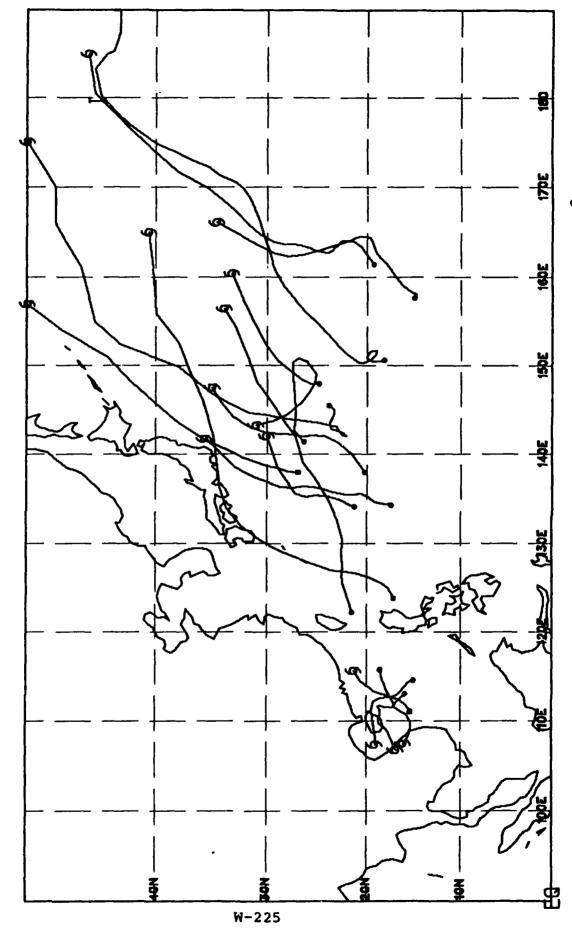
Actual path of recurving tropical cyclones (> 33 kts) developing at or north of 15°N.



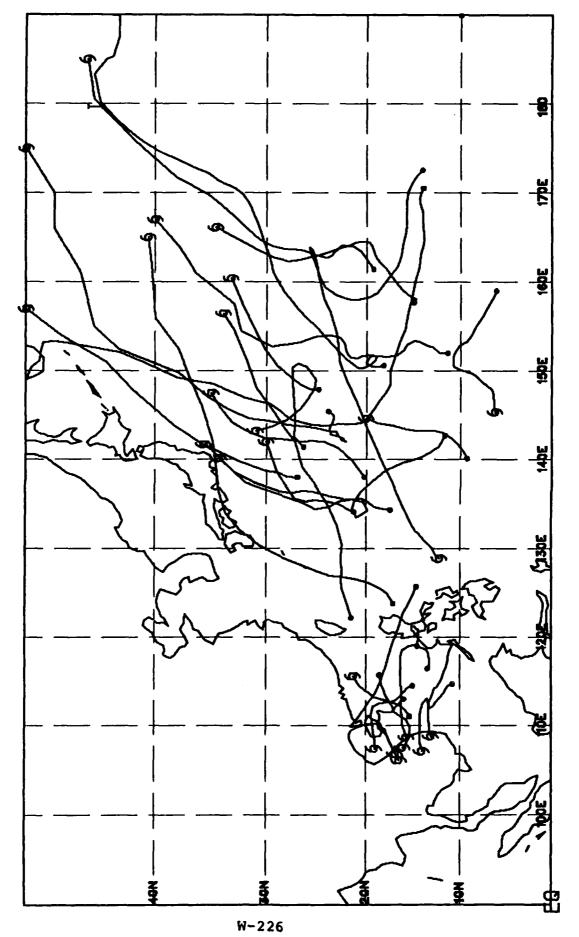
Actual path of all recurving tropical cyclones (> 33 kts).



Actual path of other tropical cyclones (> 33 kts) developing south of 15°N.



Actual path of other tropical cyclones (> 33 kts) developing at or north of 15°N.



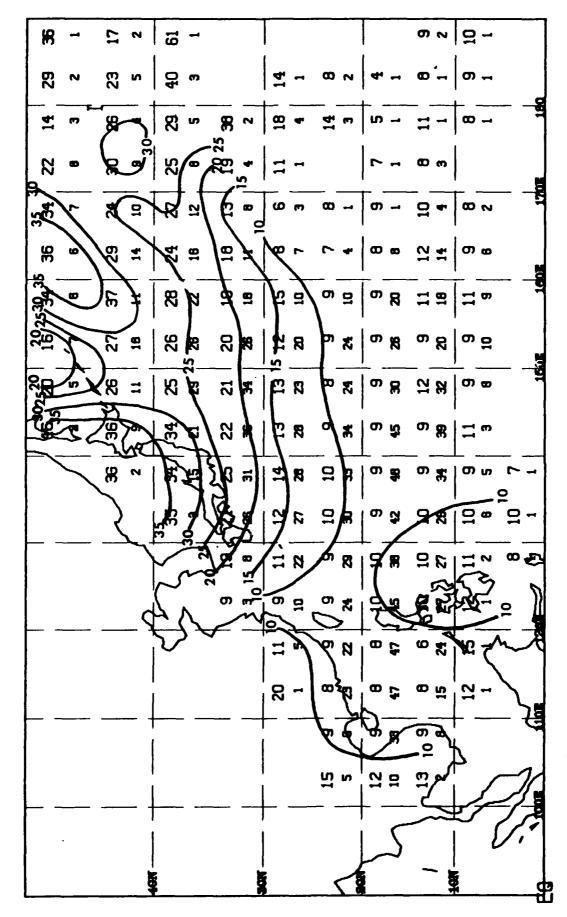
Actual path of all other tropical cyclones (> 33 kts).

CONSTANCY AND RELATIVE FREQUENCY FOR SEP 24 - OCT 8

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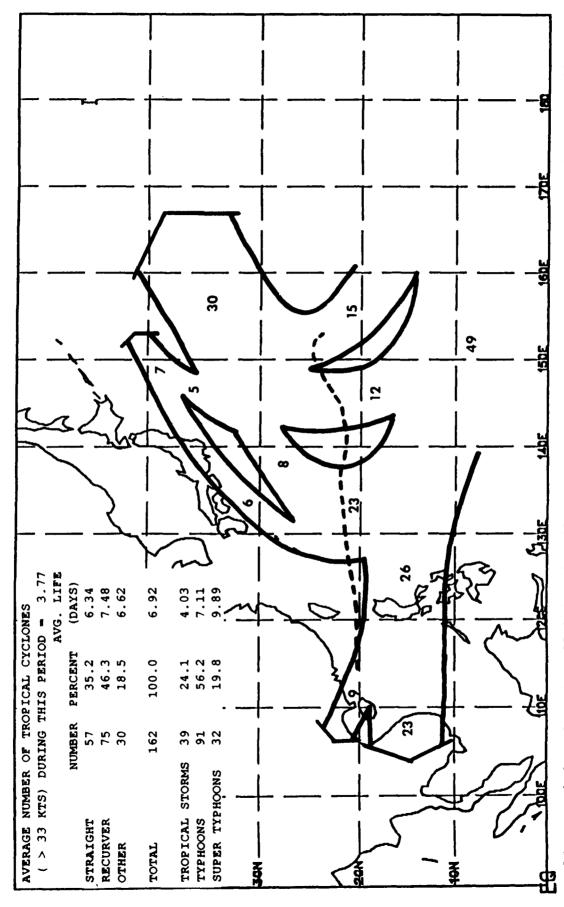
Tropical cyclone (> 33 kts) Constancy (top number) and Relative Frequency (bottom number). Constancy is defined as the 12-hr average vector speed divided by the 12-hr average scalar speed. Relative Frequency is the number of tropical cyclones passing through the 50 latitude by 50 longitude square per year per time period.

SPEED OF MOVEMENT FOR SEP 24 - OCT 8

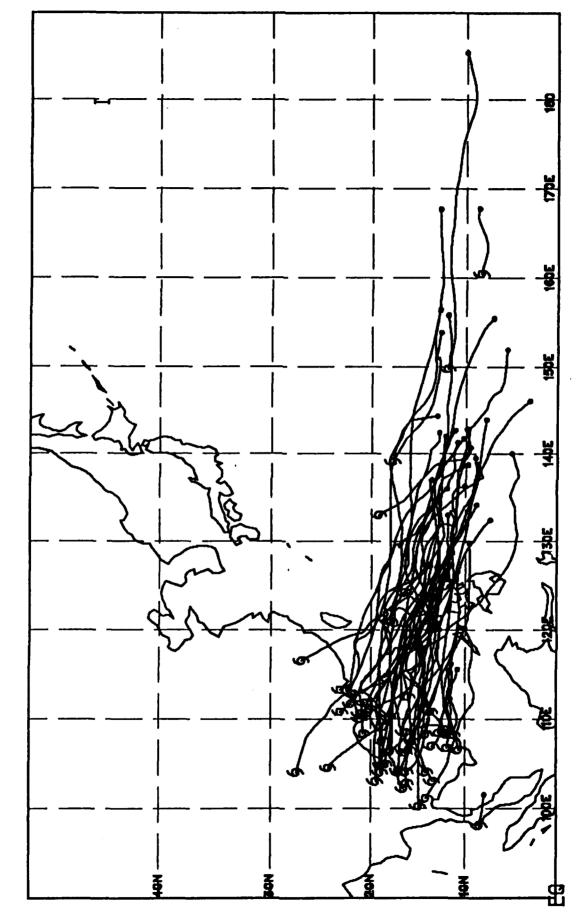


(> 33 kts) Speed (top number) in knots and sample size (bottom number) for longitude square. Contours are drawn only to those squares containing at Average tropical cyclone each 5° latitude by 5° least 5% of the sample.

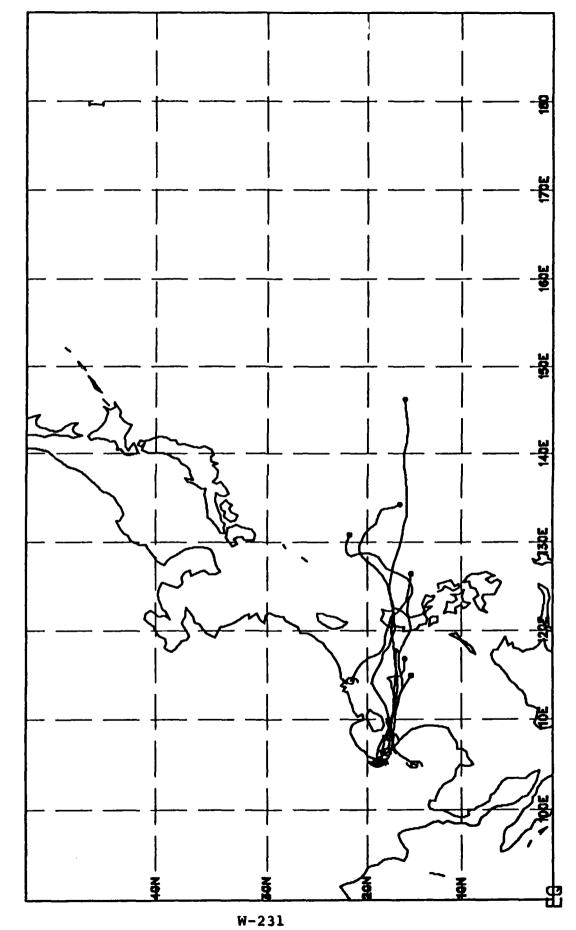
MEAN PATHS FOR OCT 9 - OCT 23



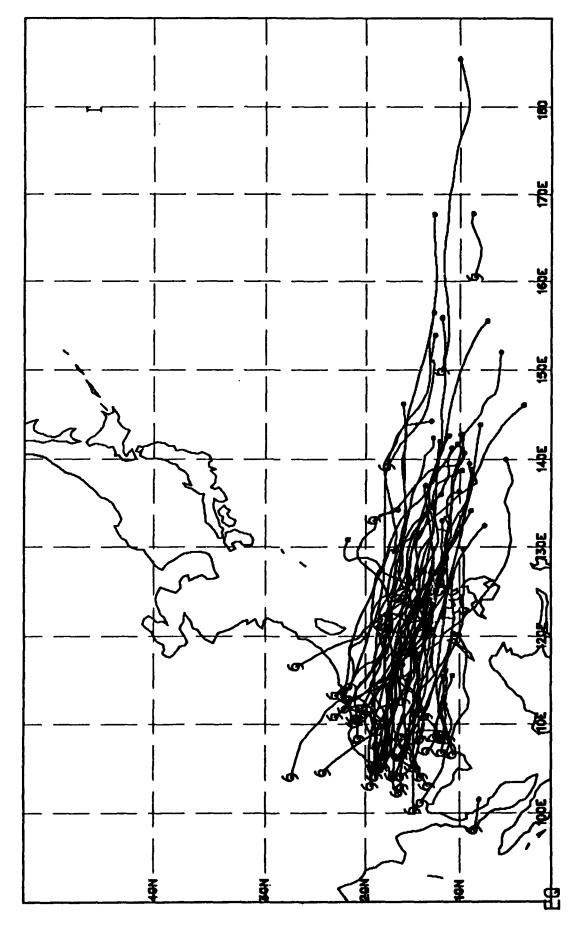
Dashed line represents mean recurvature position of up to 100% since not all tropical cyclones a path. Tracks which contained less than of tropical cyclones (> percentage along a path. ppe Numbers represent may not and some develop/dissipate 33 kts) are ignored. numbers tropical cyclones (> 33 kts) classified as recurvers. These 33 kts) path. path. path cyclones followed the indicated a mean tropical cyclone (> 33 kts) follow 5% of the tropical Mean which



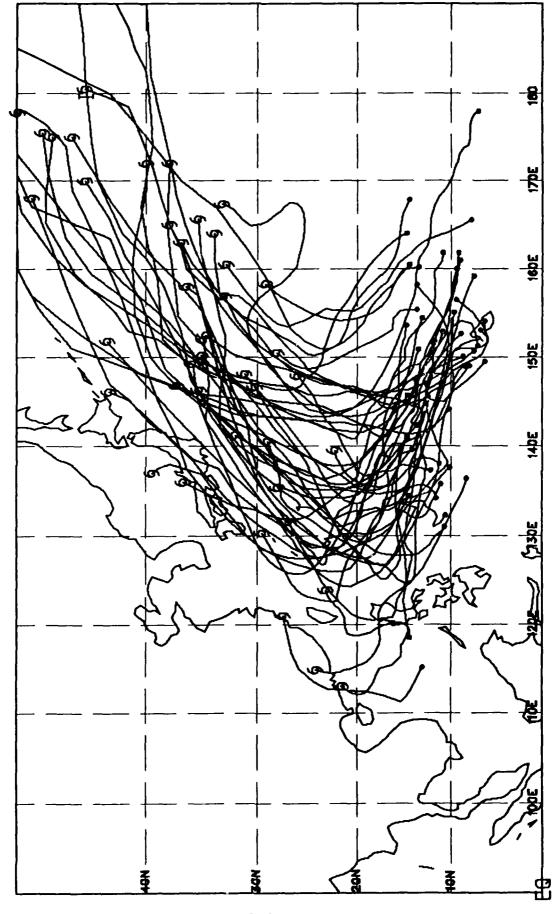
Actual path of straight tropical cyclones (> 33 kts) developing south of 15°N.



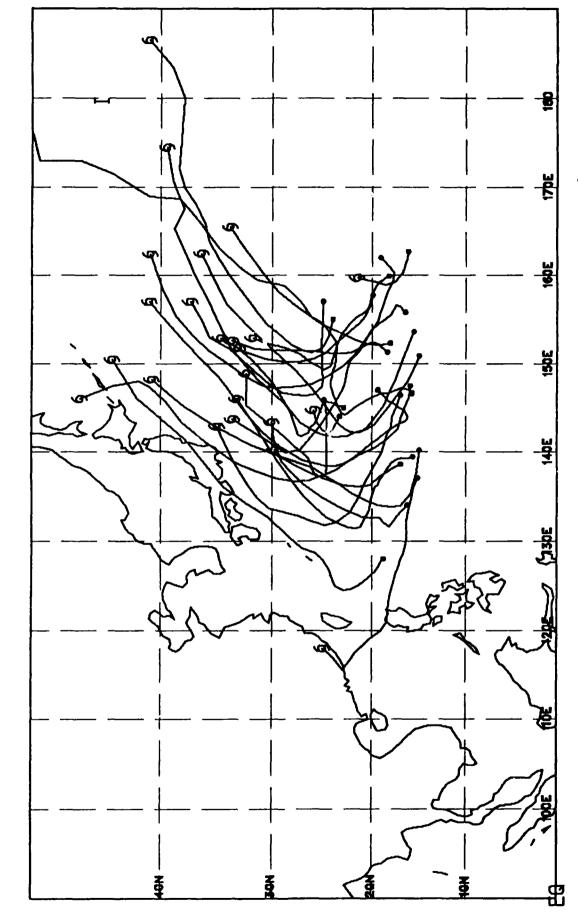
Actual path of straight tropical cyclones (> 33 kts) developing at or north of 15°N.



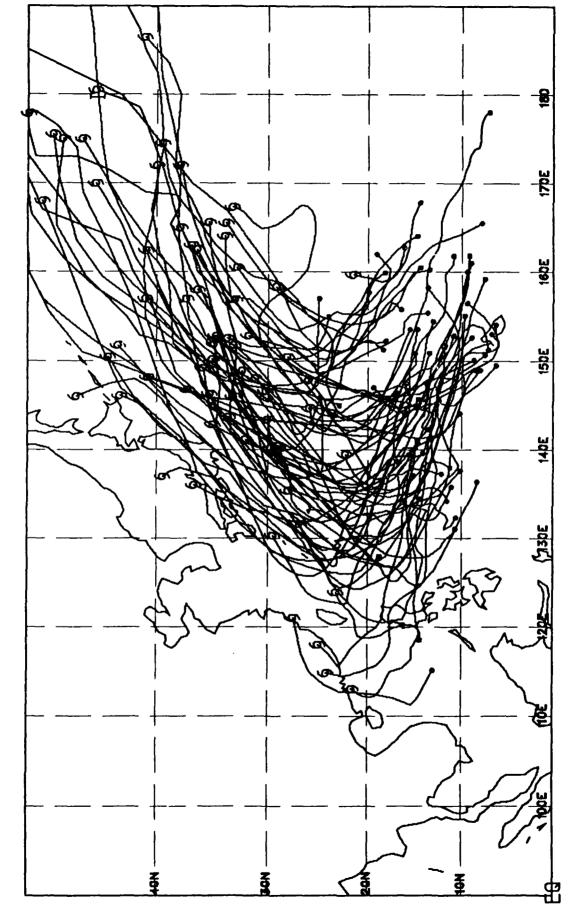
Actual path of all straight tropical cyclones (> 33 kts).



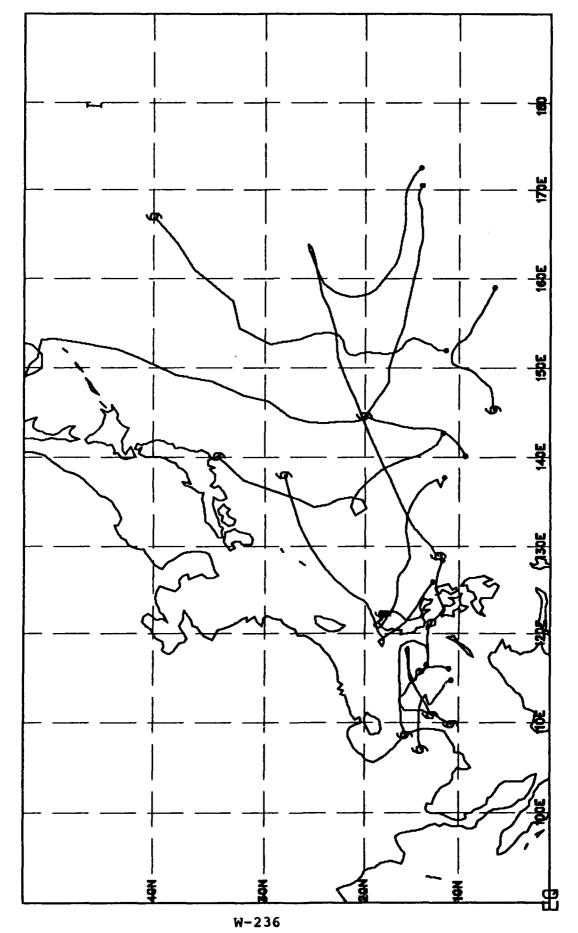
Actual path of recurving tropical cyclones (> 33 kts) developing south of 150N.



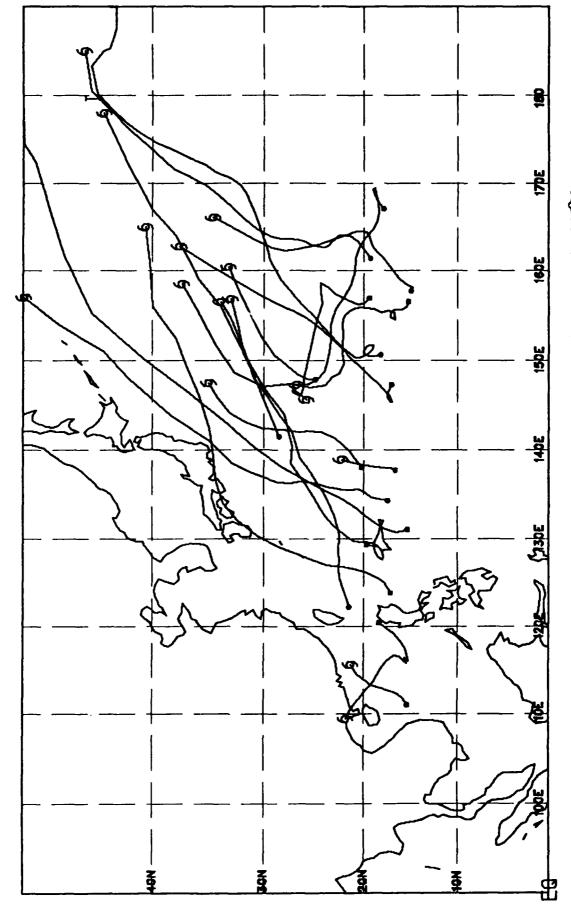
Actual path of recurving tropical cyclones (> 33 kts) developing at or north of 15°N.



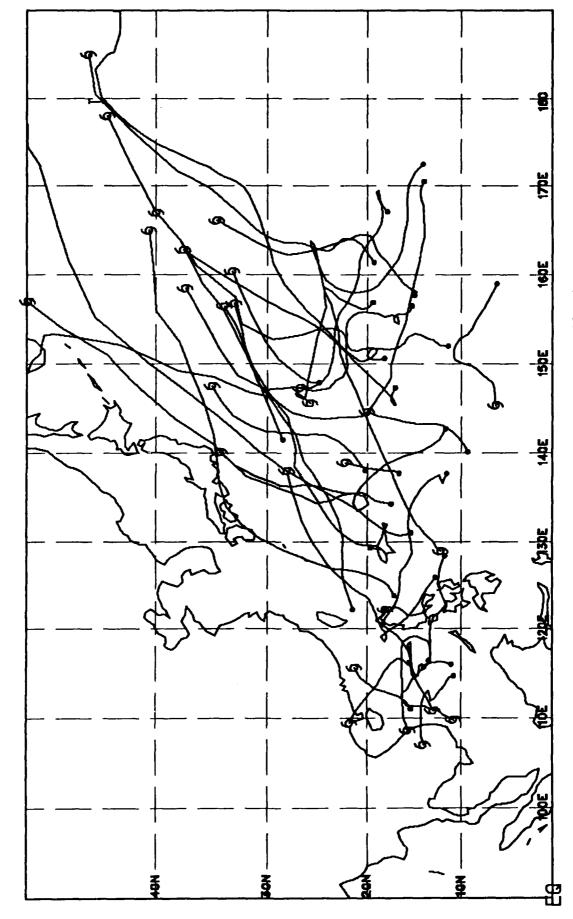
Actual path of all recurving tropical cyclones (> 33 kts).



Actual path of other tropical cyclones (> 33 kts) developing south of 150N.



Actual path of other tropical cyclones (> 33 kts) developing at or north of 15°N.



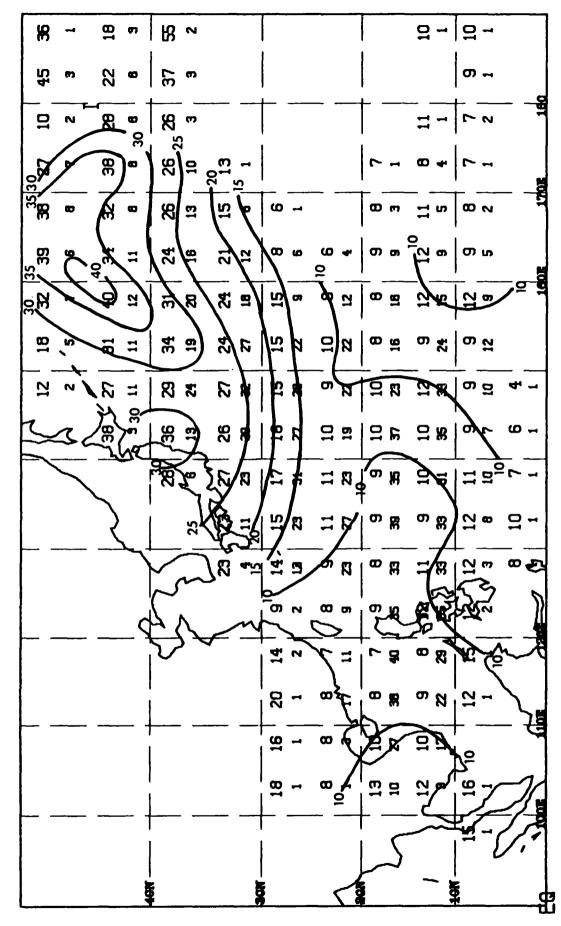
Actual path of all other tropical cyclones (> 33 kts).

CONSTANCY AND RELATIVE FREQUENCY FOR OCT 9 - OCT 23

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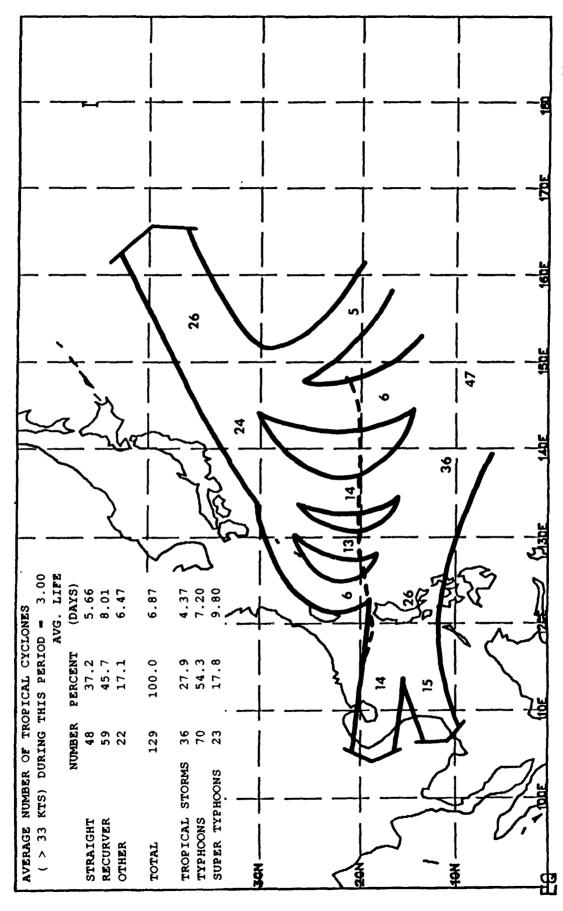
Tropical cyclone (> 33 kts) Constancy (top number) and Relative Frequency (bottom number). Constancy is defined as the 12-hr average vector speed divided by the 12-hr average scalar speed. Relative Frequency is the number of tropical cyclones passing through the 50 latitude by 50 longitude square per year per time period.

SPEED OF MOVEMENT FOR OCT 9 - OCT 23

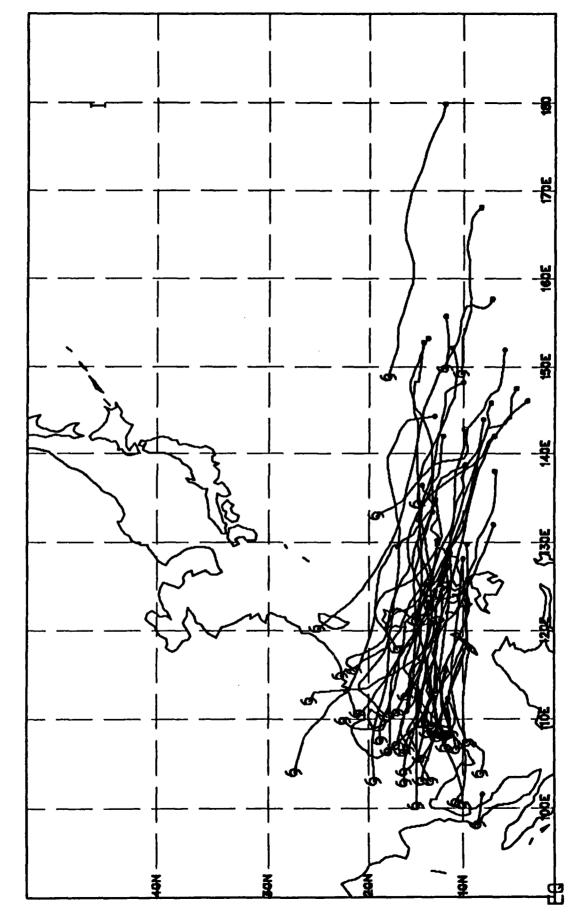


Average tropical cyclone (> 33 kts) Speed (top number) in knots and sample size (bottom number) for each 5° latitude by 5° longitude square. Contours are drawn only to those squares containing at least 5% of the sample.

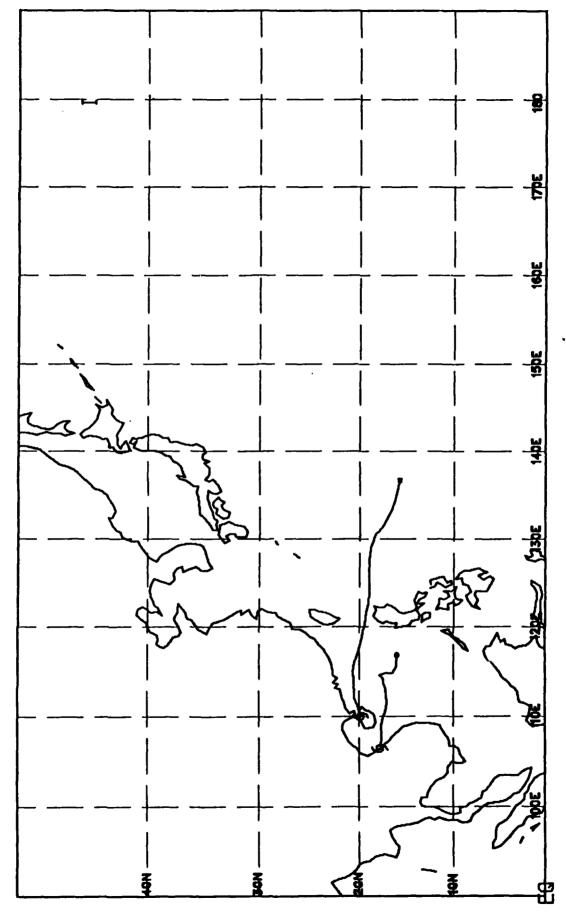
MEAN PATHS FOR OCT 24 - NOV 8



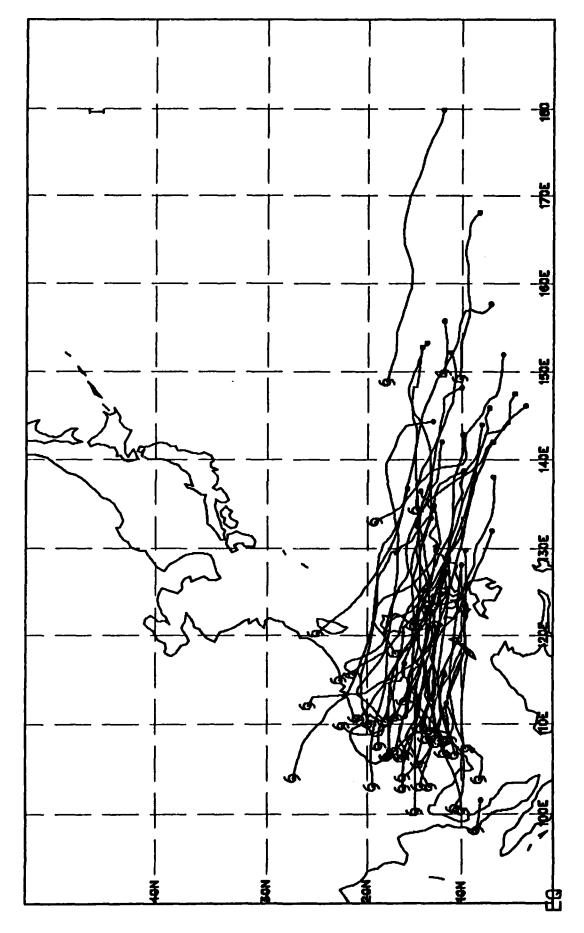
Dashed line represents mean recurvature position of 33 kts) cyclones Tracks which contained less than of tropical cyclones (> to 100% since not all tropical percentage along a path. represent may not and some develop/dissipate > 33 kts) are ignored. Numbers numbers tropical cyclones (> 33 kts) classified as recurvers. These path. 33 kms) path cyclones the indicated a mean cyclone (> 33 kts) follow 5% of the tropical tropical c which



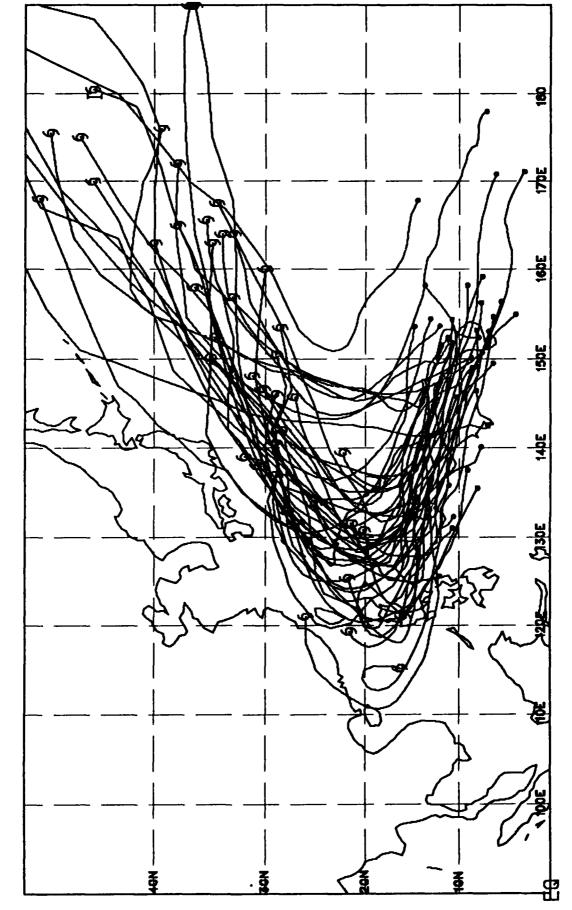
Actual path of straight tropical cyclones (> 33 kts) developing south of 15°N.



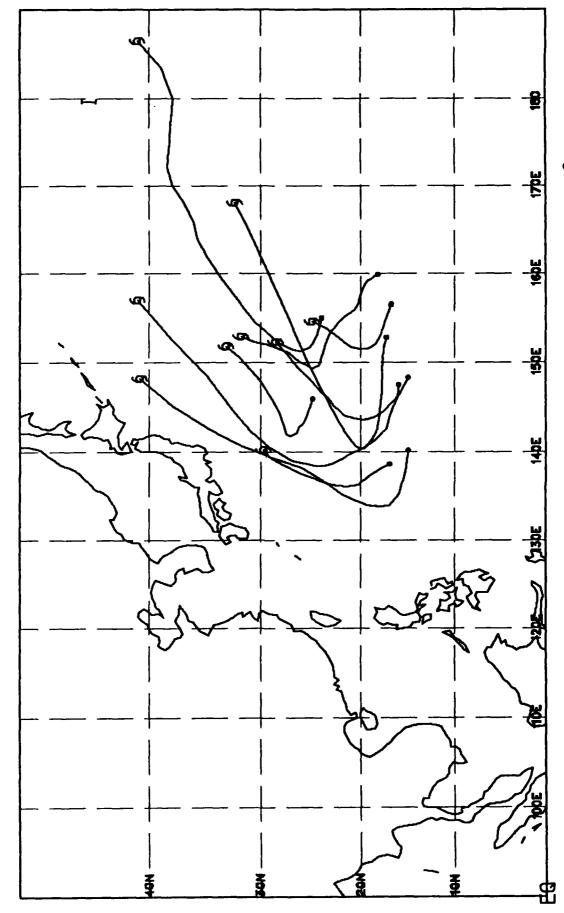
Actual path of straight tropical cyclones (> 33 kts) developing at or north of 15°N.



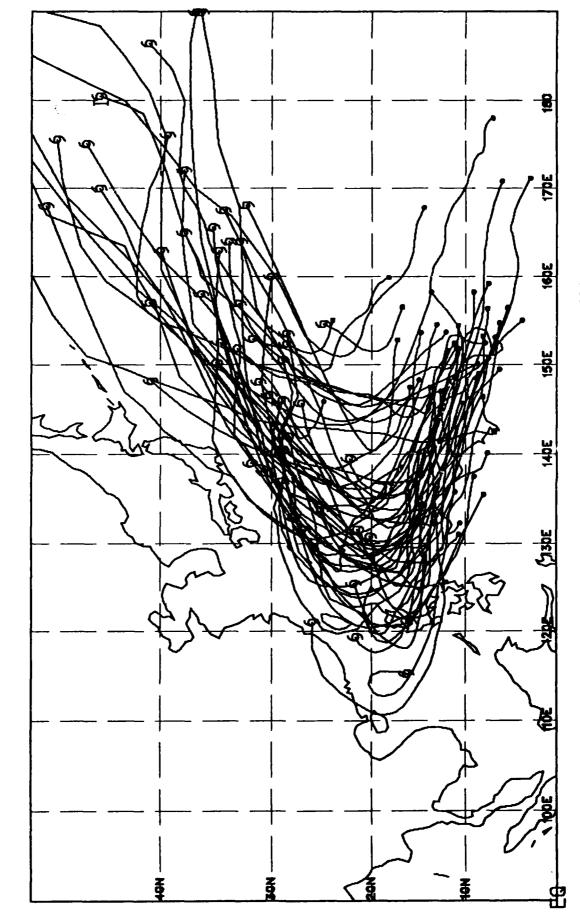
Actual path of all straight tropical cyclones (> 33 kts).



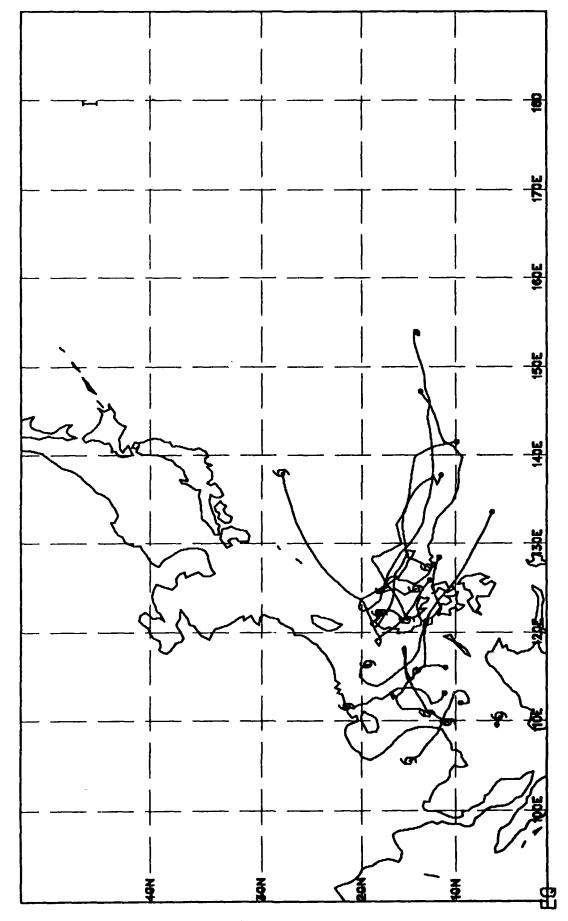
Actual path of recurving tropical cyclones (> 33 kts) developing south of 15°N.



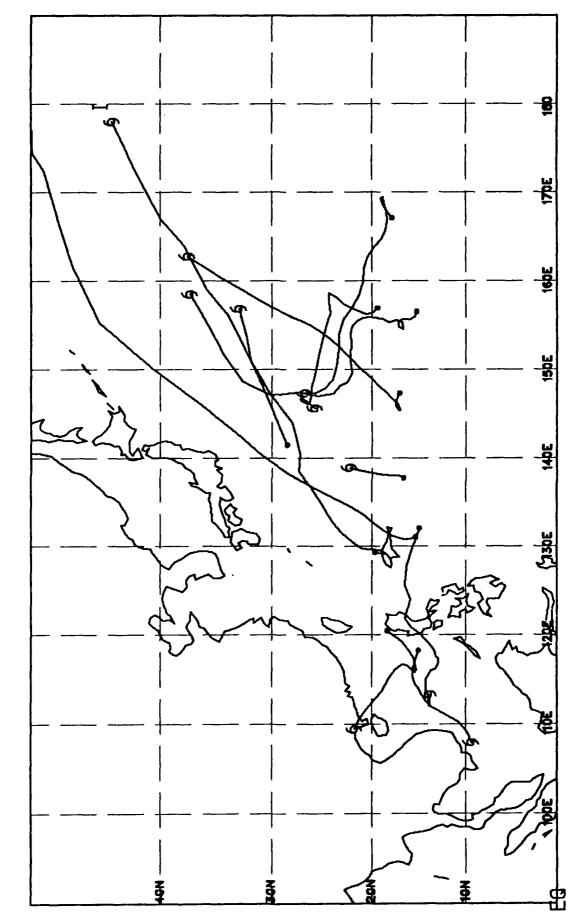
Actual path of recurving tropical cyclones (> 33 kts) developing at or north of 15°N.



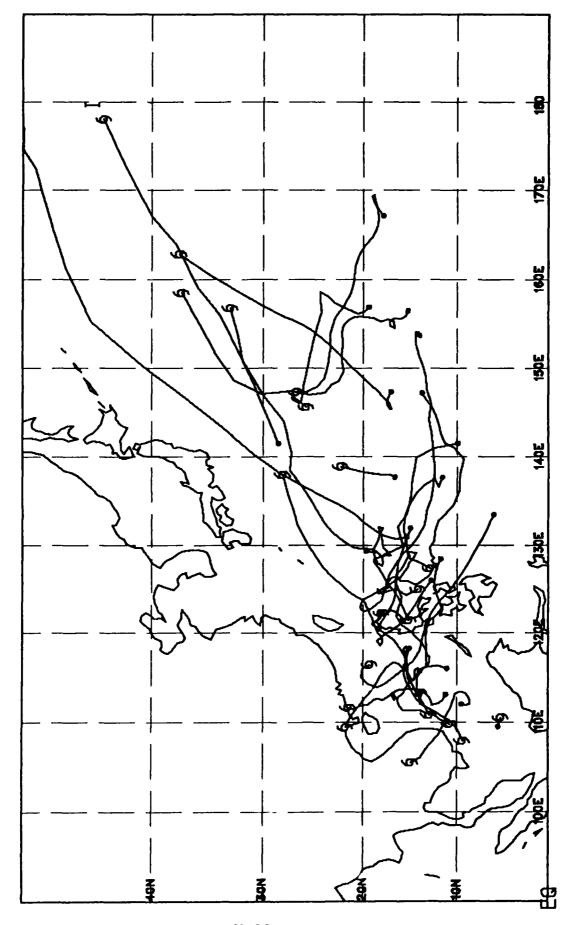
Actual path of all recurving tropical cyclones (> 33 kts).



Actual path of other tropical cyclones (>33 kts) developing south of 15°N.



Actual path of other tropical cyclones (> 33 kts) developing at or north of 15°N.



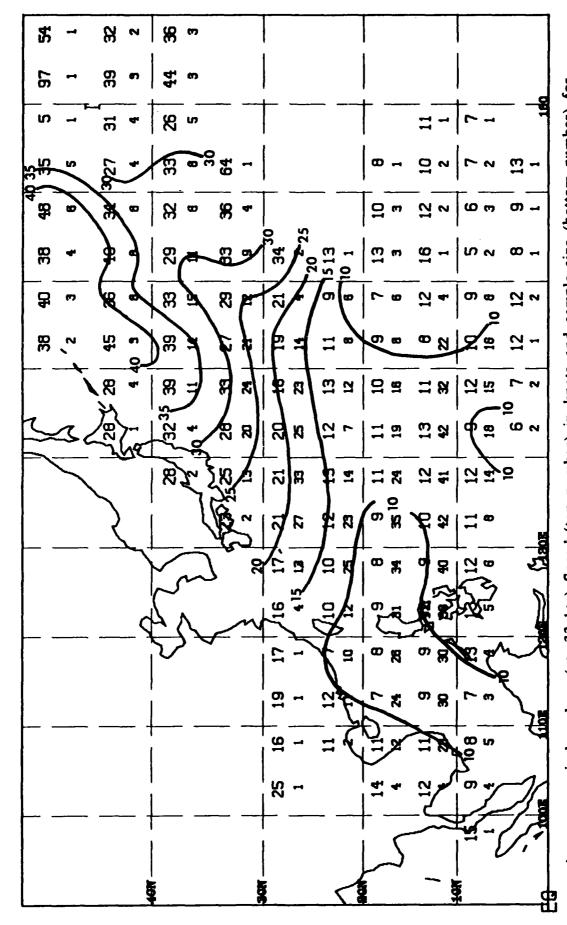
Actual path of all other tropical cyclones (>33 kts).

CONSTANCY AND RELATIVE FREQUENCY FOR OCT 24 - NOV 8

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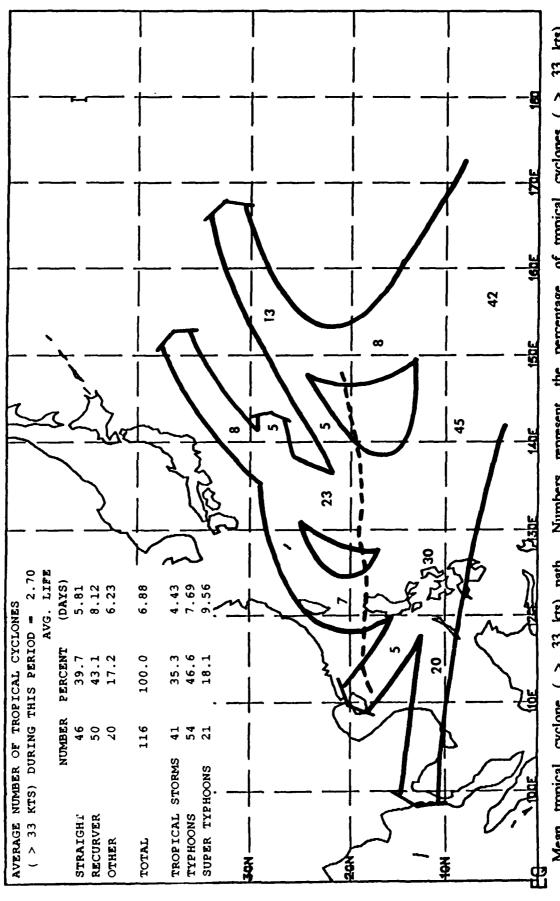
Tropical cyclone (> 33 kts) Constancy (top number) and Relative Frequency (bottom number). Constancy is defined as the 12-hr average vector speed divided by the 12-hr average scalar speed. Relative Frequency is the number of tropical cyclones passing through the 50 latitude by 50 longitude square per year per time period.

SPEED OF MOVEMENT FOR OCT 24 - NOV 8

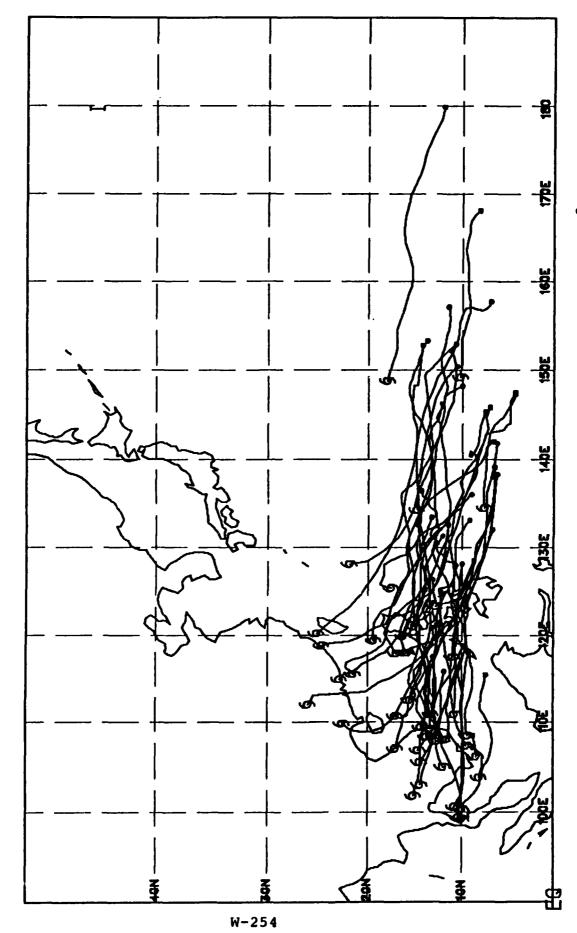


(> 33 kts) Speed (top number) in knots and sample size (bottom number) for longitude square. Contours are drawn only to those squares containing at and sample size (bottom number) for Average tropical cyclone each 50 latitude by 50 each 50 latitude by least 5% of the sample.

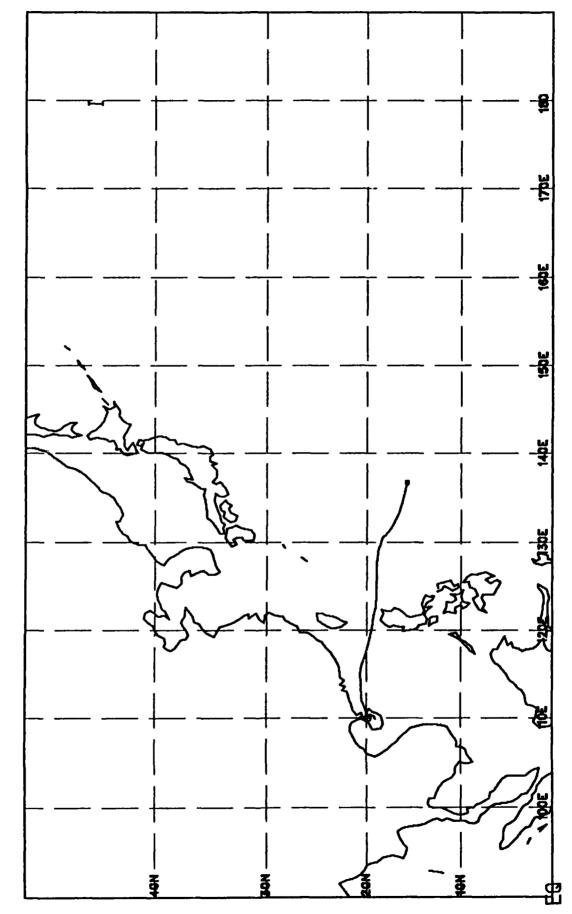
MEAN PATHS FOR NOV 9 - NOV 23



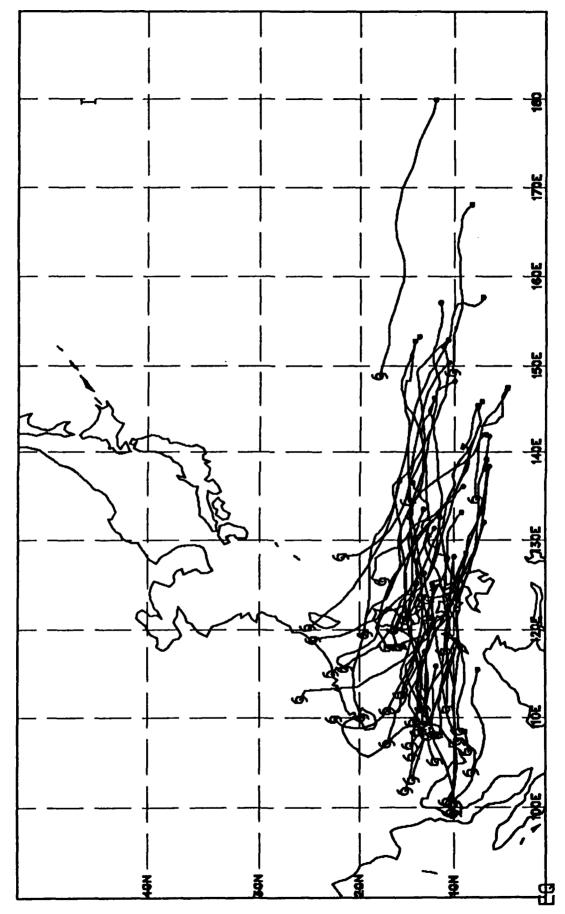
Dashed line represents mean recurvature position of cyclones Tracks which contained less than up to 100% since not all tropical cyclones (of tropical percentage along a path. add a represent may not and some develop/dissipate 33 kts) are ignored. Numbers numbers tropical cyclones (> 33 kts) classified as recurvers. These path. 33 kts) path cyclones followed the indicated a mean cyclone 33 kts) follow 5% of the tropical tropical Mean which



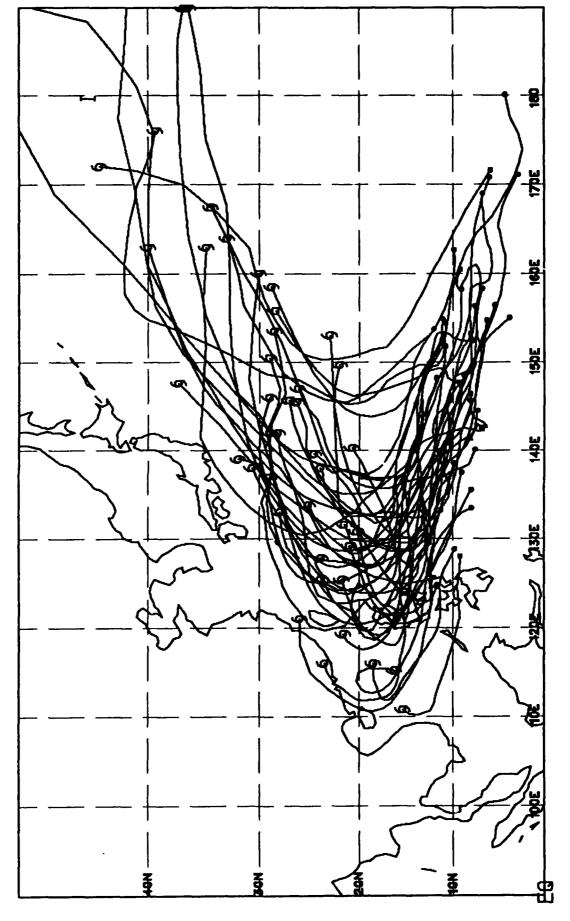
Actual path of straight tropical cyclones (> 33 kts) developing south of 15°N.



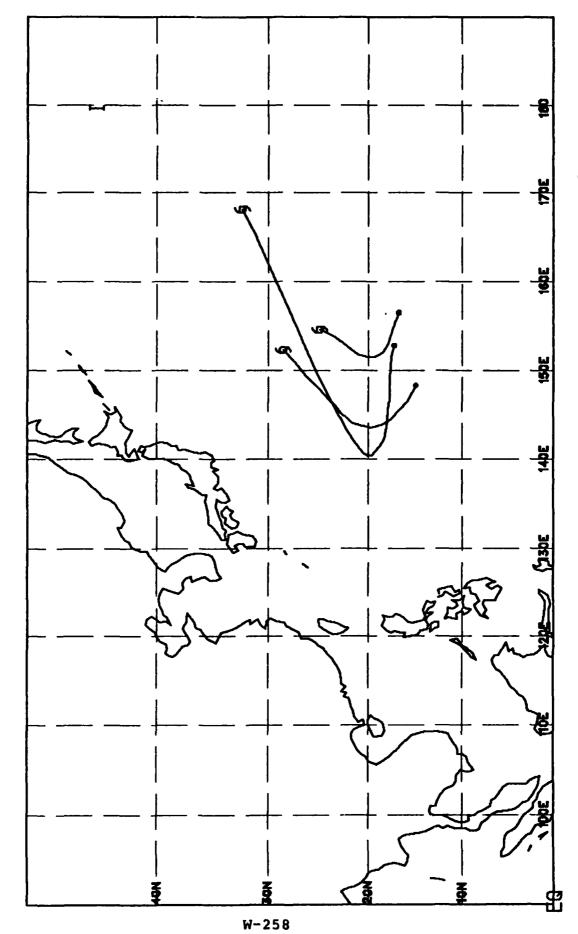
Actual path of straight tropical cyclones (> 33 kts) developing at or north of 15°N.



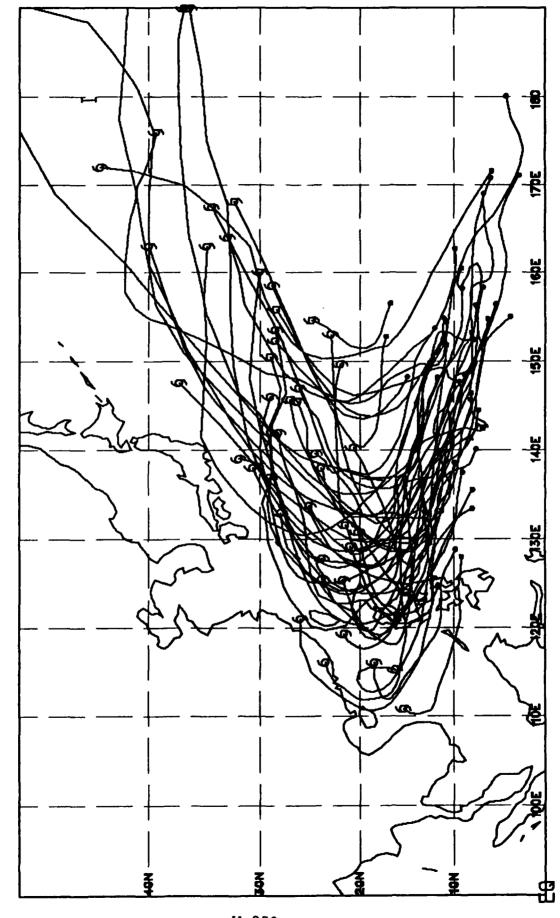
Actual path of all straight tropical cyclones (> 33 kts).



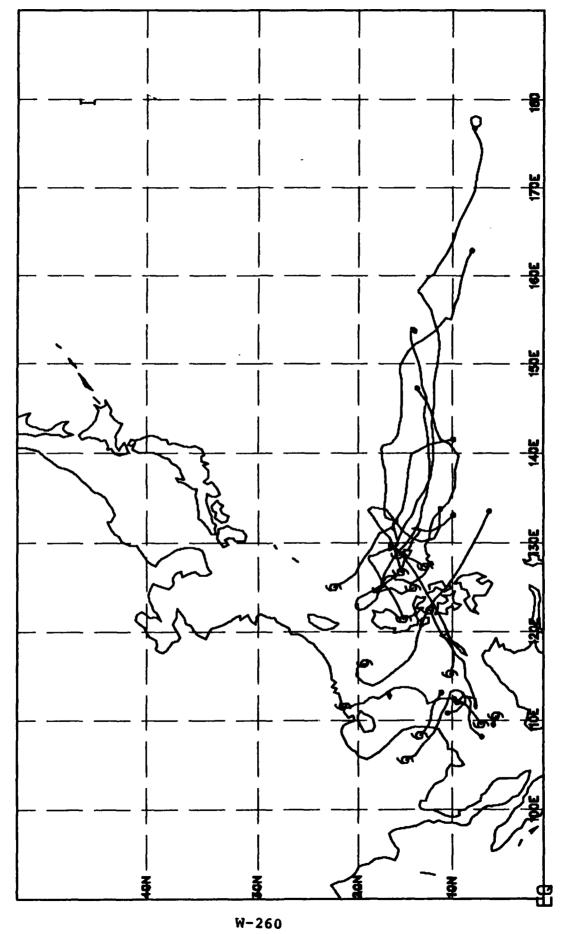
Actual path of recurving tropical cyclones (> 33 kts) developing south of 15°N.



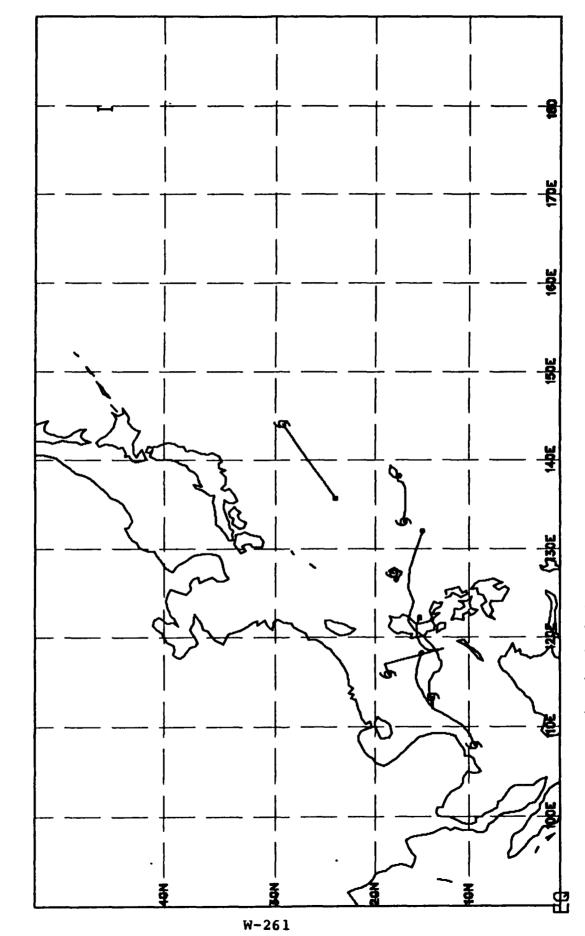
Actual path of recurving tropical cyclones (> 33 kts) developing at or north of 15°N.



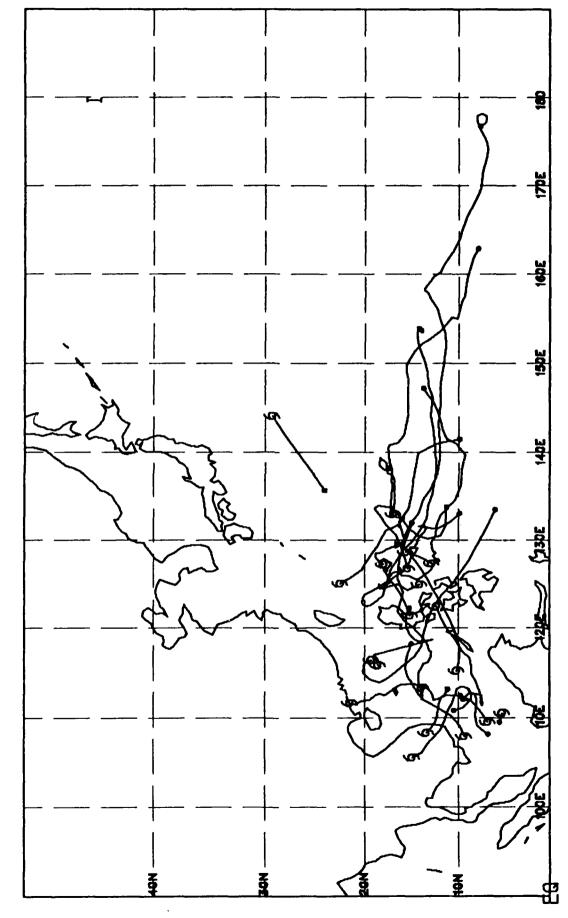
Actual path of all recurving tropical cyclones (> 33 kts).



Actual path of other tropical cyclones (> 33 kts) developing south of 150N.



Actual path of other tropical cyclones (> 33 kts) developing at or north of 15°N.



Actual path of all other tropical cyclones (> 33 krs).

CONSTANCY AND RELATIVE FREQUENCY FOR NOV 9 - NOV 23

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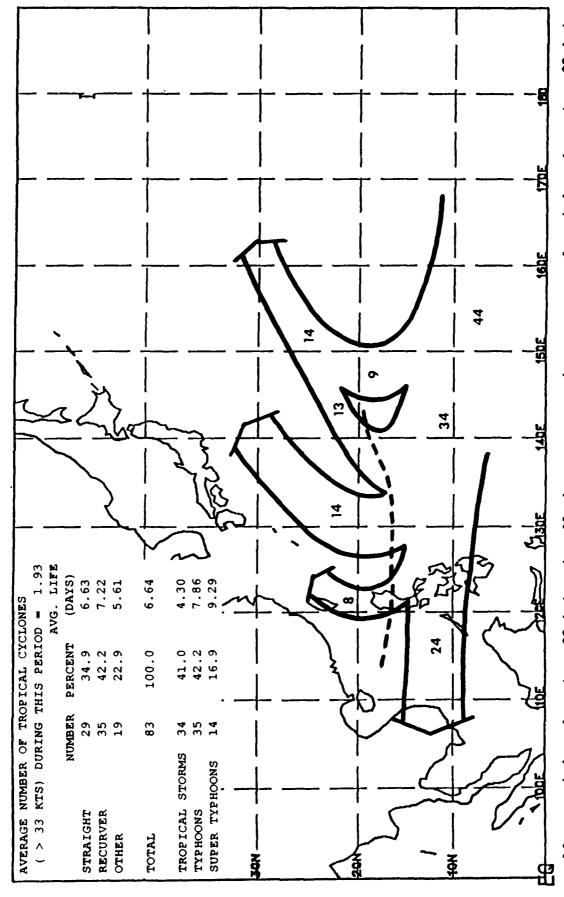
Tropical cyclone (> 33 kts) Constancy (top number) and Relative Frequency (bottom number). Constancy is defined as the 12-hr average vector speed divided by the 12-hr average scalar speed. Relative Frequency is the number of tropical cyclones passing through the 50 latitude by 50 longitude square per year per time period.

SPEED OF MOVEMENT FOR NOV 9 - NOV 23

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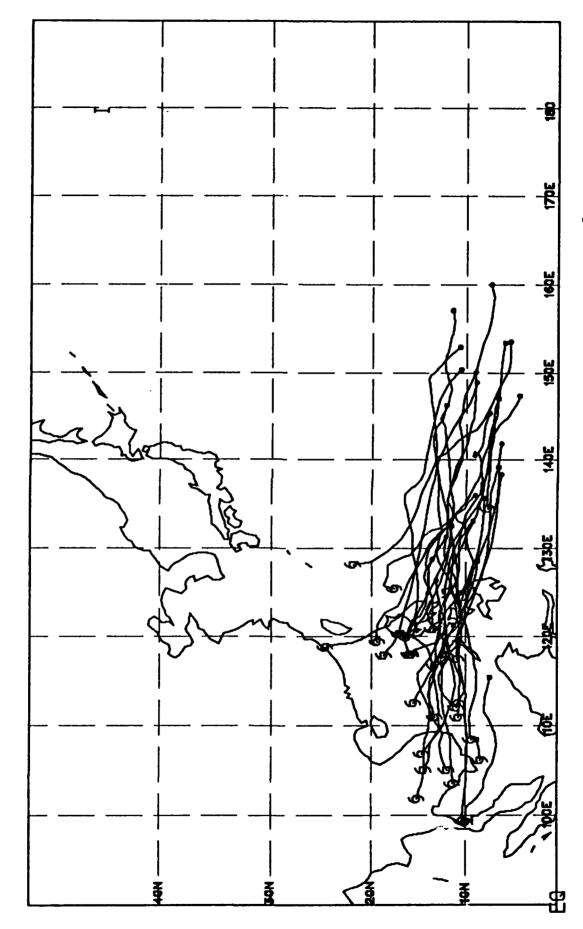
Average tropical cyclone (> 33 kts) Speed (top number) in knots and sample size (bottom number) for each 5° latitude by 5° longitude square. Contours are drawn only to those squares containing at least 5% of the sample.

MEAN PATHS FOR NOV 24 - DEC 8

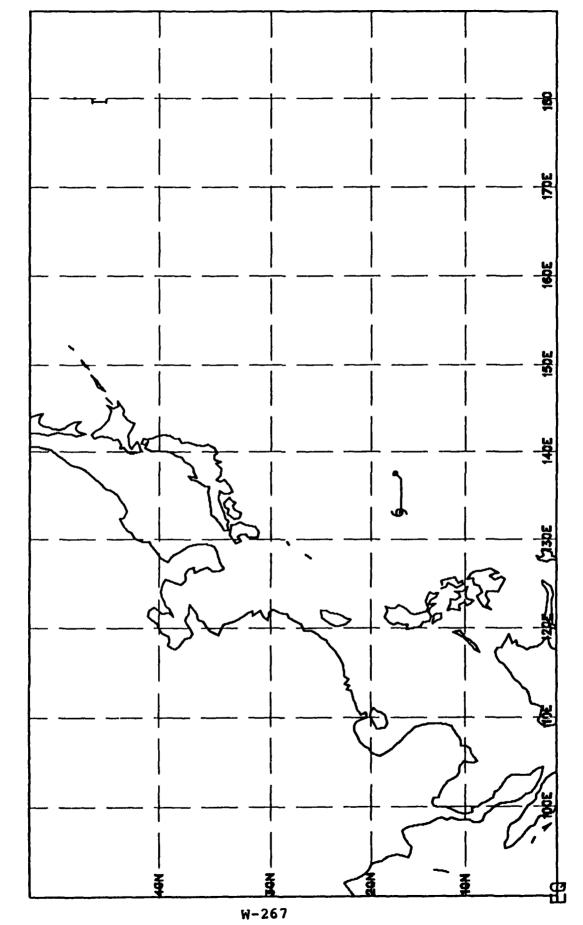


Dashed line represents mean recurvature position of 33 kts) cyclones Tracks which contained less than of tropical cyclones (> to 100% since not all tropical percentage path. along a add may not represent path and some develop/dissipate (> 33 kts) are ignored. Numbers numbers tropical cyclones (> 33 kts) classified as recurvers. These 33 kts) path. path. cyclones indicated a mean cyclone (> 33 kts) follow followed the 5% of the tropical tropical which Mean ۸

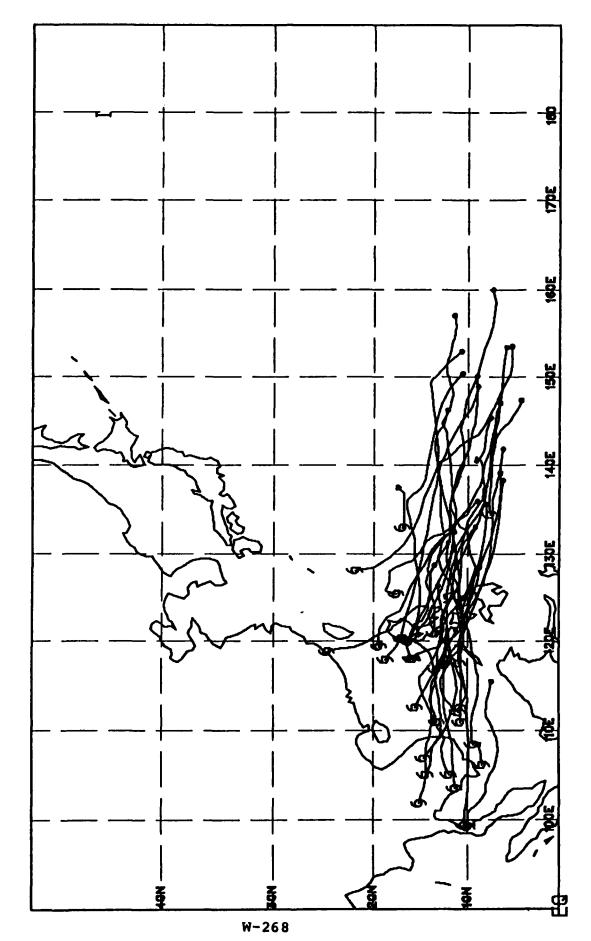
W-265



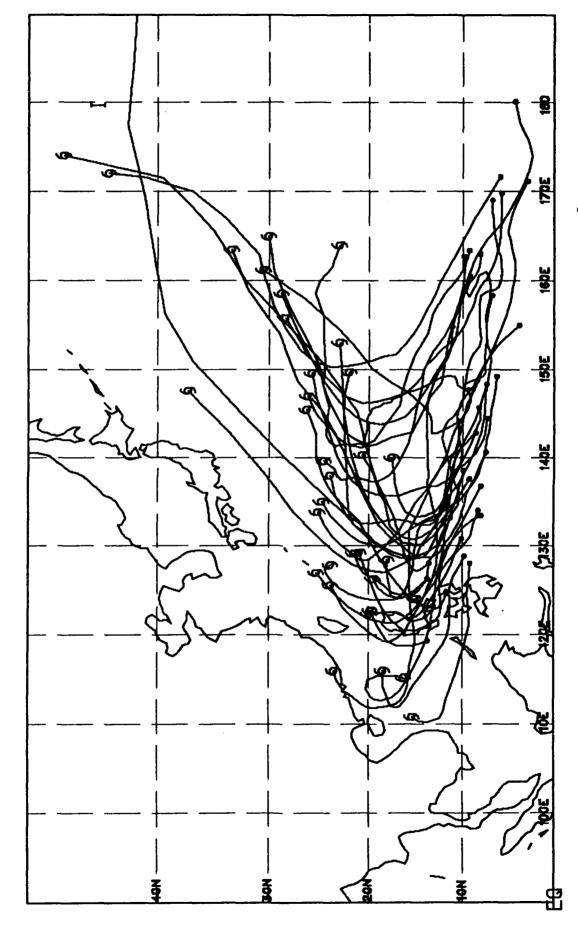
Actual path of straight tropical cyclones (> 33 kts) developing south of 15°N.



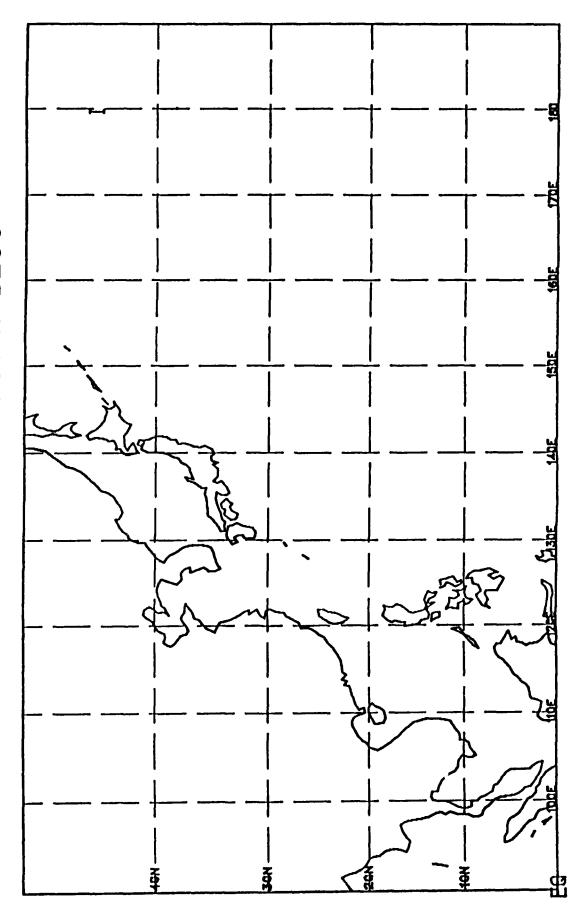
Actual path of straight tropical cyclones (> 33 kts) developing at or north of 15°N.



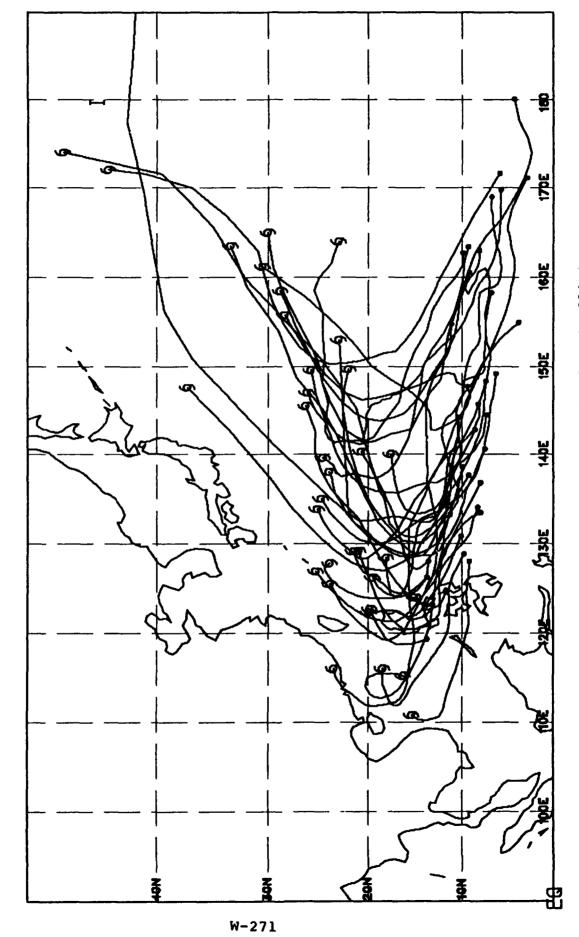
Actual path of all straight tropical cyclones (> 33 kts).



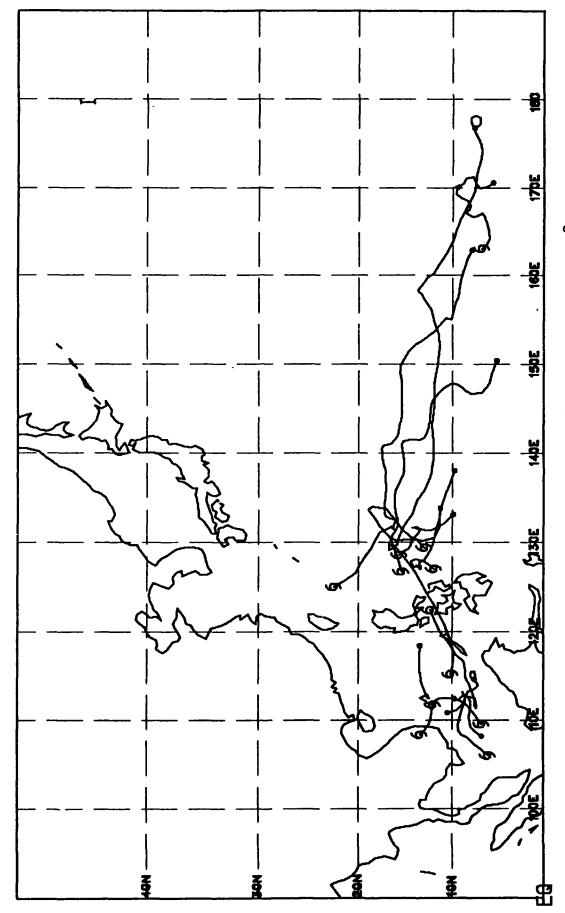
Actual path of recurving tropical cyclones (> 33 kts) developing south of 15°N.



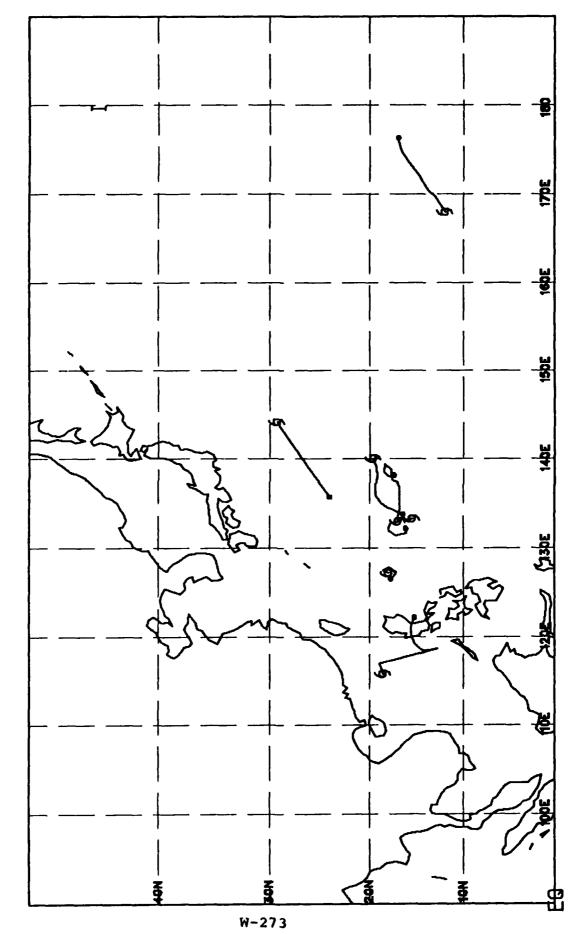
Actual path of recurving tropical cyclones (> 33 kts) developing at or north of 15°N.



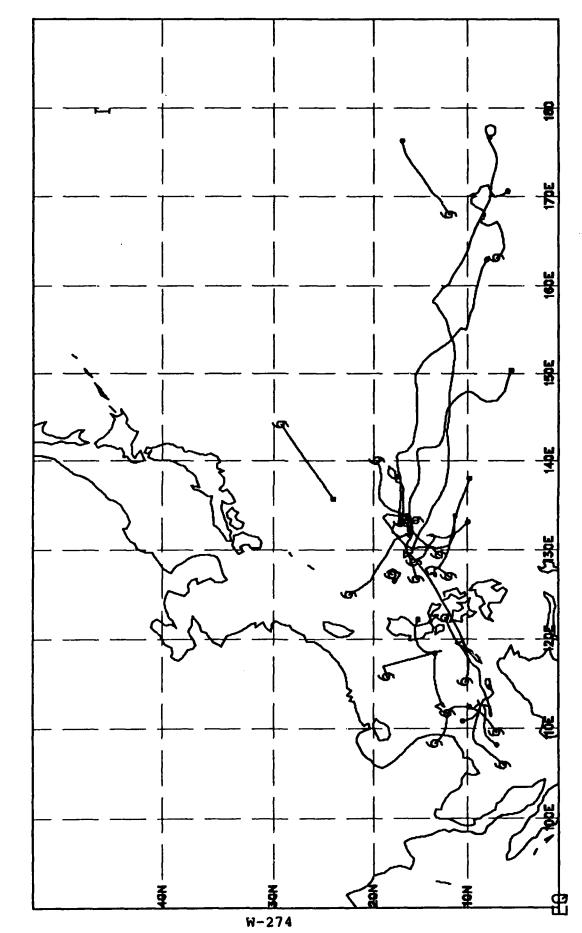
Actual path of all recurving tropical cyclones (> 33 kts).



Actual path of other tropical cyclones (> 33 kts) developing south of 150N.



Actual path of other tropical cyclones (> 33 kts) developing at or north of 15°N.



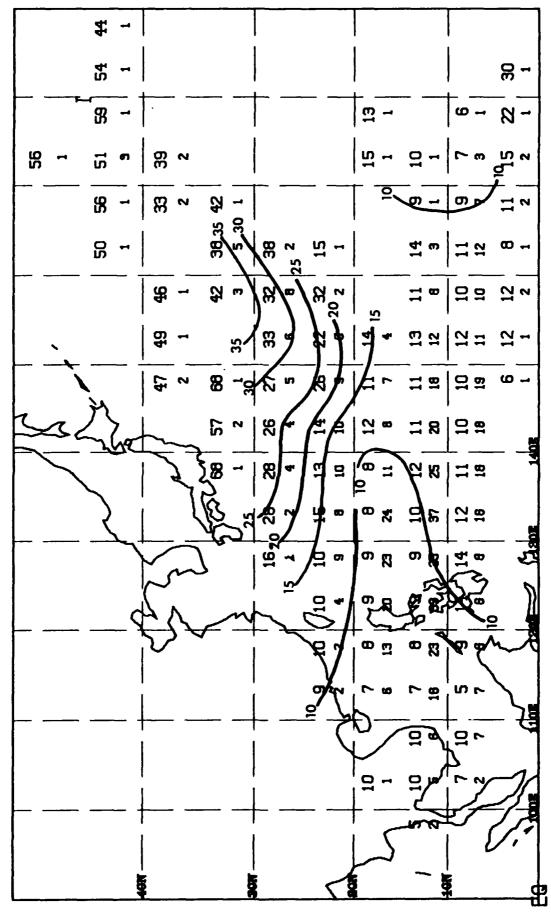
Actual path of all other tropical cyclones (>33 kts).

CONSTANCY AND RELATIVE FREQUENCY FOR NOV 24 - DEC 8

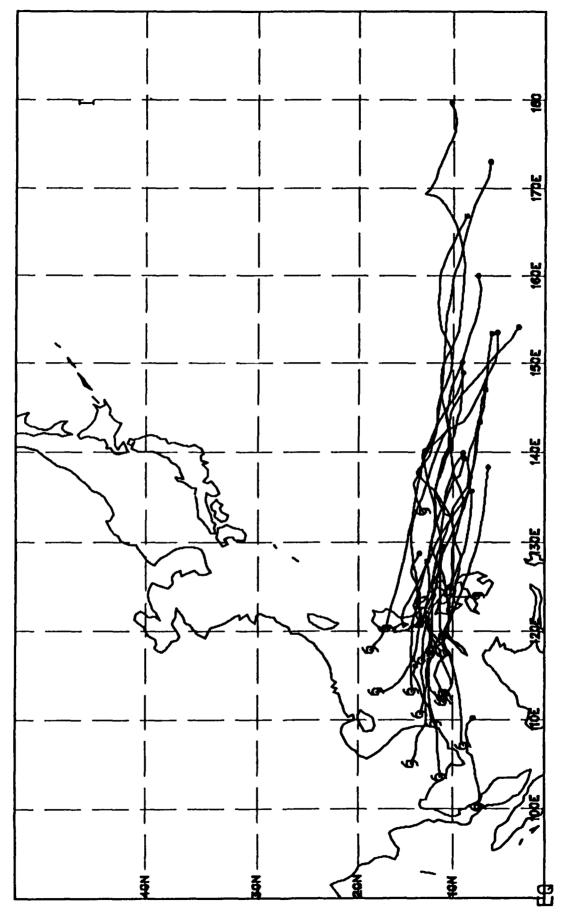
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Tropical cyclone (> 33 kts) Constancy (top number) and Relative Frequency (bottom number). Constancy is defined as the 12-hr average vector speed divided by the 12-hr average scalar speed. Relative Frequency is the number of tropical cyclones passing through the 50 latitude by 50 longitude square per year per time period.

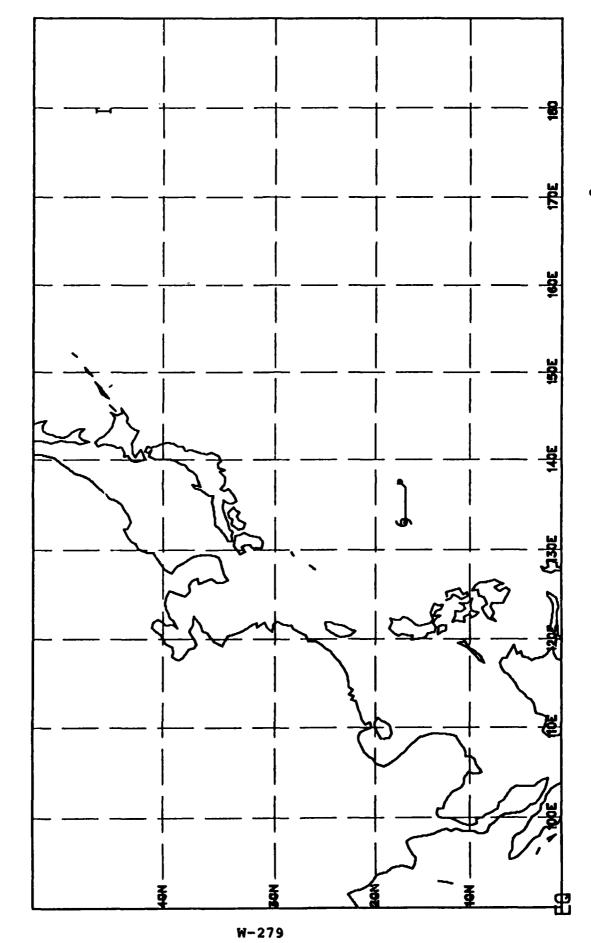
SPEED OF MOVEMENT FOR NOV 24 - DEC 8



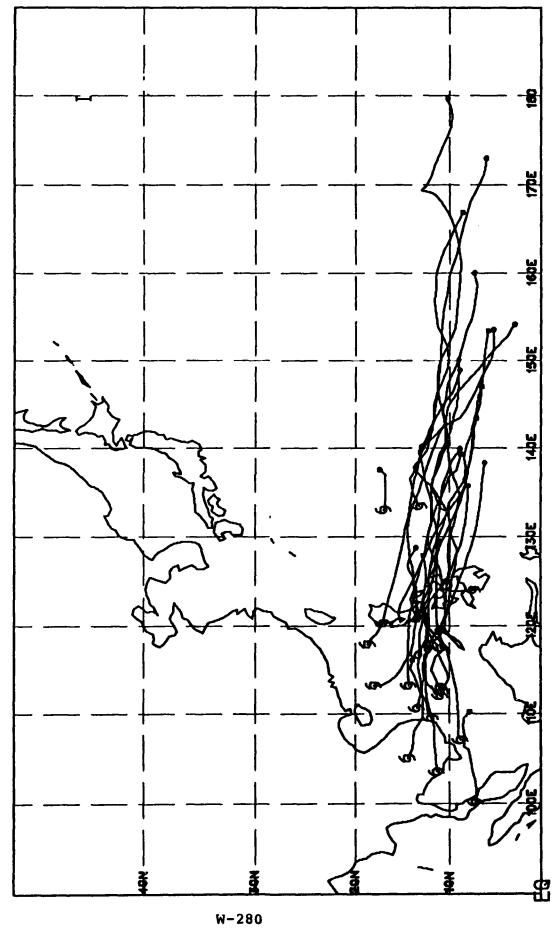
(> 33 kts) Speed (top number) in knots and sample size (bottom number) for longitude square. Contours are drawn only to those squares containing at longitude square. Average tropical cyclone each 5° latitude by 5° least 5% of the sample.



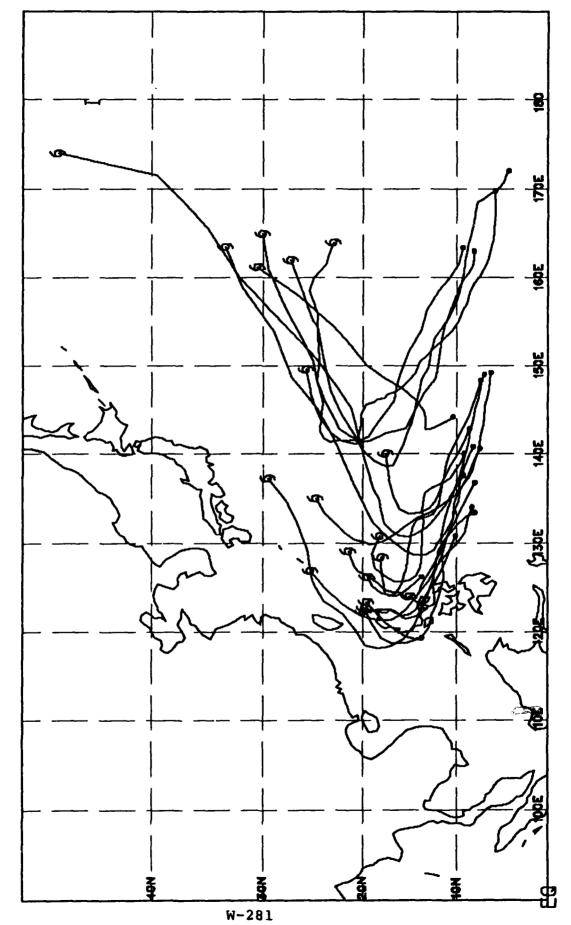
Actual path of straight tropical cyclones (> 33 kts) developing south of 15°N.



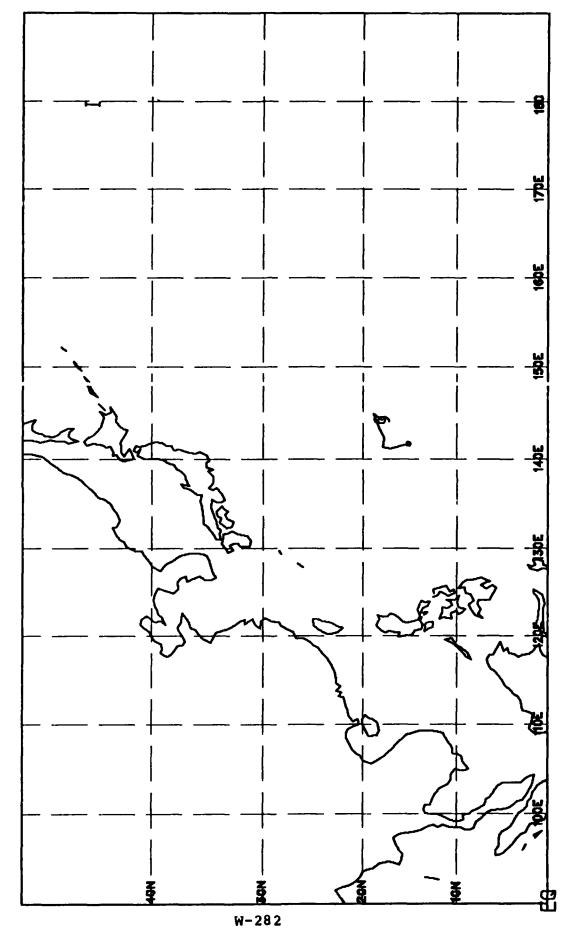
Actual path of straight tropical cyclones (> 33 kts) developing at or north of 15°N.



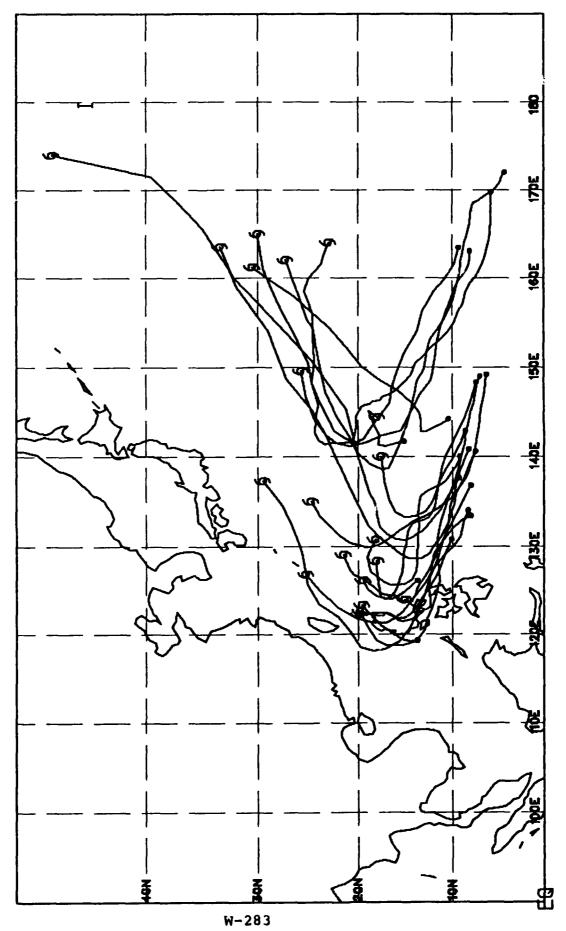
Actual path of all straight tropical cyclones (> 33 kts).



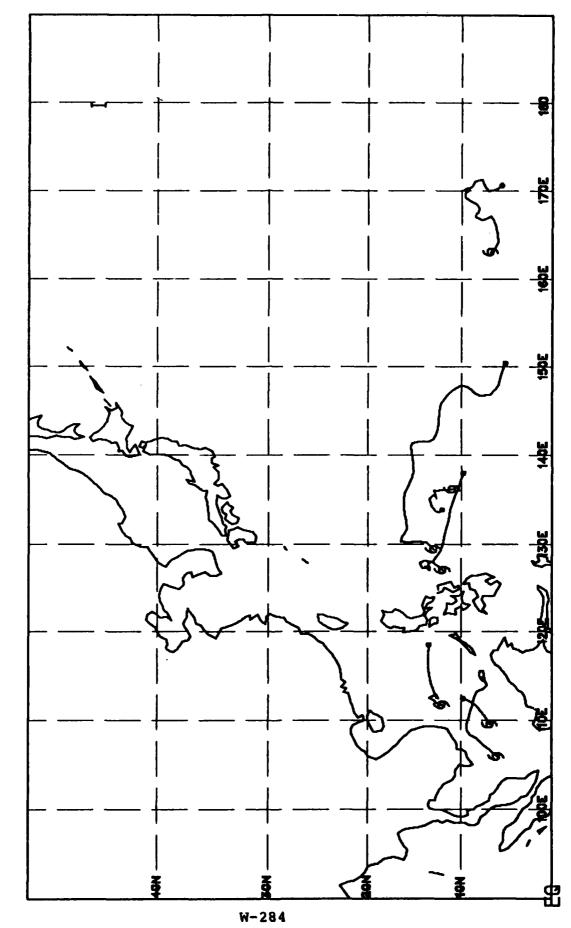
Actual path of recurving tropical cyclones (> 33 kts) developing south of 15°N.



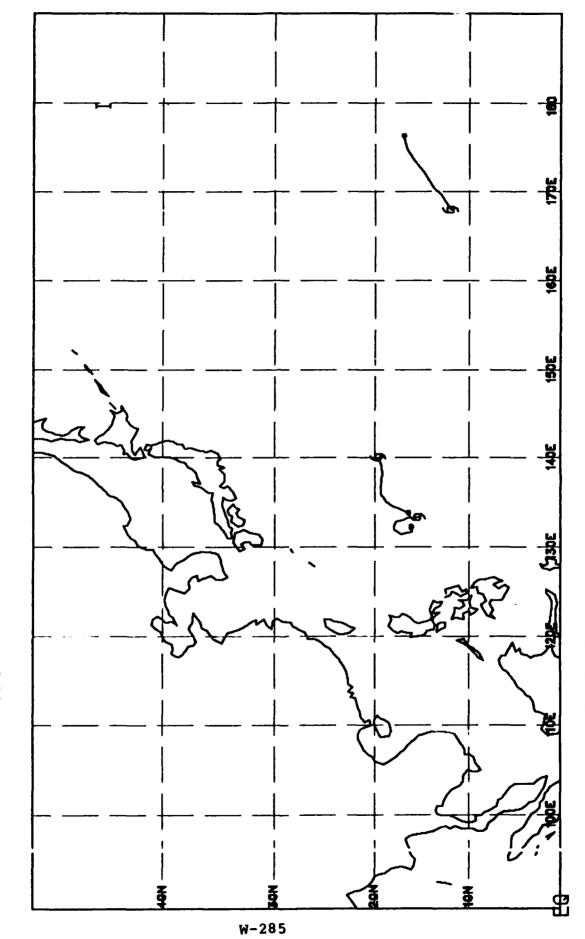
Actual path of recurving tropical cyclones (> 33 kts) developing at or north of 15°N.



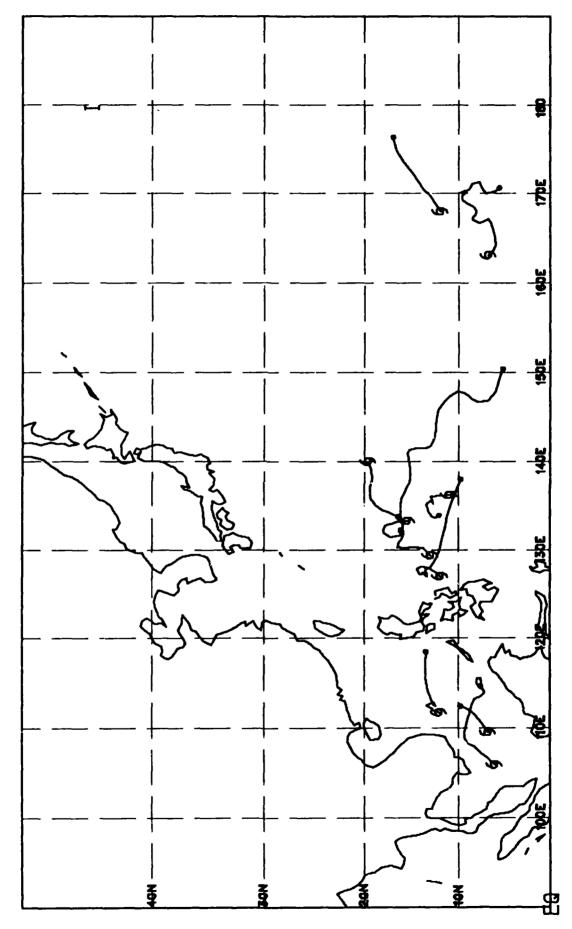
Actual path of all recurving tropical cyclones (> 33 kts).



Actual path of other tropical cyclones (>33 kts) developing south of 159N.



Actual path of other tropical cyclones (> 33 kts) developing at or north of 15°N.



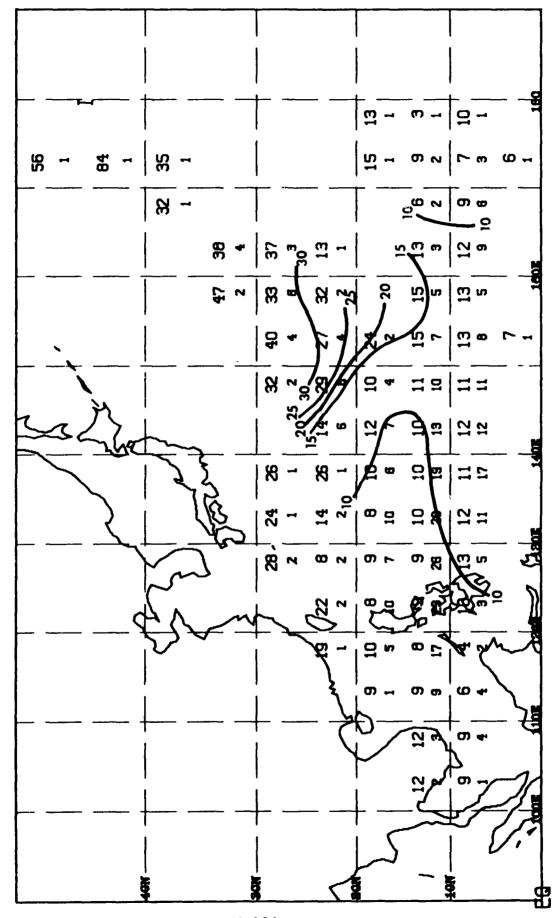
Actual path of all other tropical cyclones (>33 kts).

CONSTANCY AND RELATIVE FREQUENCY FOR DEC 9 - DEC 23

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Tropical cyclone (> 33 kts) Constancy (top number) and Relative Frequency (bottom number). Constancy is defined as the 12-hr average vector speed divided by the 12-hr average scalar speed. Relative Frequency is the number of tropical cyclones passing through the 50 latitude by 50 longitude square per year per time period.

SPEED OF MOVEMENT FOR DEC 9 - DEC 23



(> 33 kts) Speed (top number) in knots and sample size (bottom number) for longitude square. Contours are drawn only to those squares containing at Average tropical cyclone each 5° latitude by 5° least 5% of the sample.

0 NO TROPICAL CYCLONES-DURING THIS PERIOD

DEC 24 - JAN 8

E-1

NO TROPICAL CYCLONES-DURING THIS PERIOD

JAN 9 - JAN 23

E-2

NO TROPICAL CYCLONES-0 DURING THIS PERIOD

JAN 24 - FEB 8

E-3

NO TROPICAL CYCLONES-DURING THIS PERIOD

FEB 9 - FEB 23

R-4

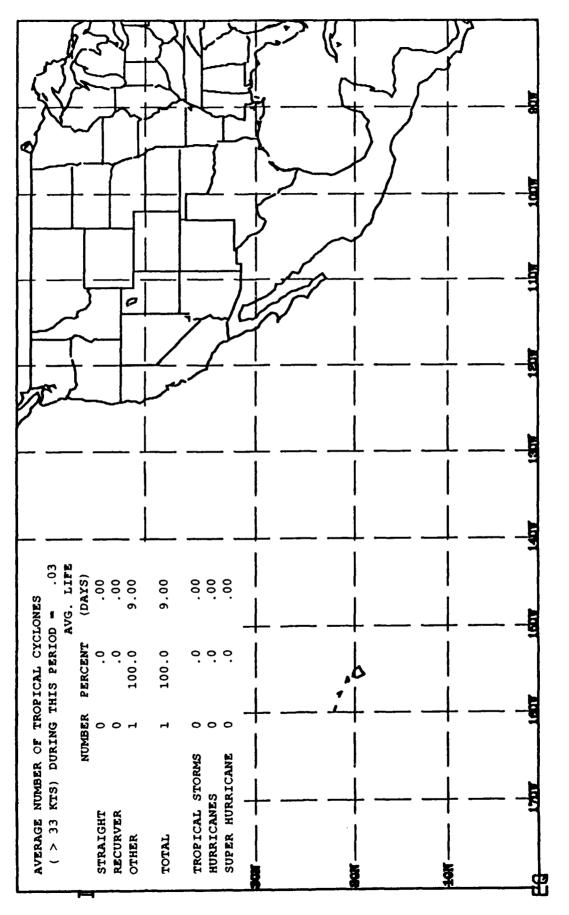
0 NO TROPICAL CYCLONES DURING THIS PERIOD

FEB 24 - MAR 8

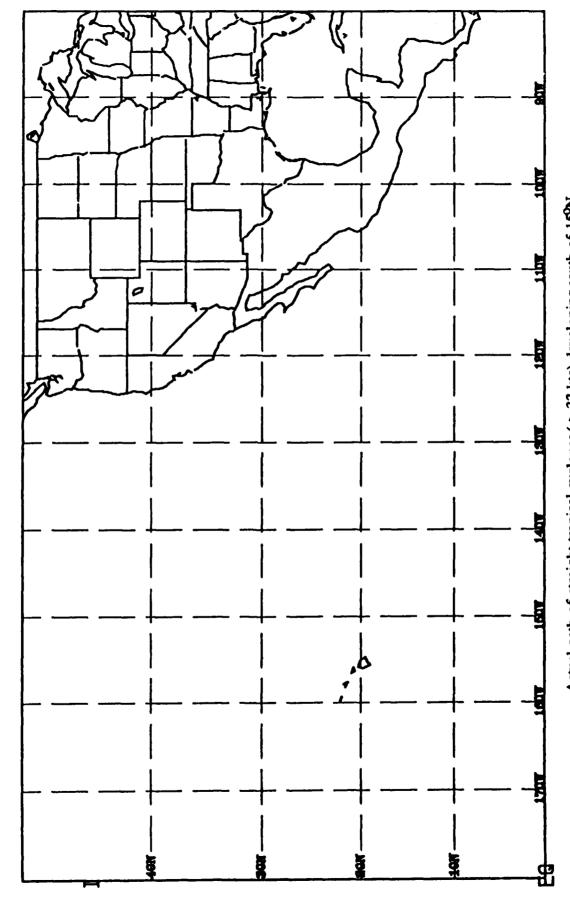
B-5

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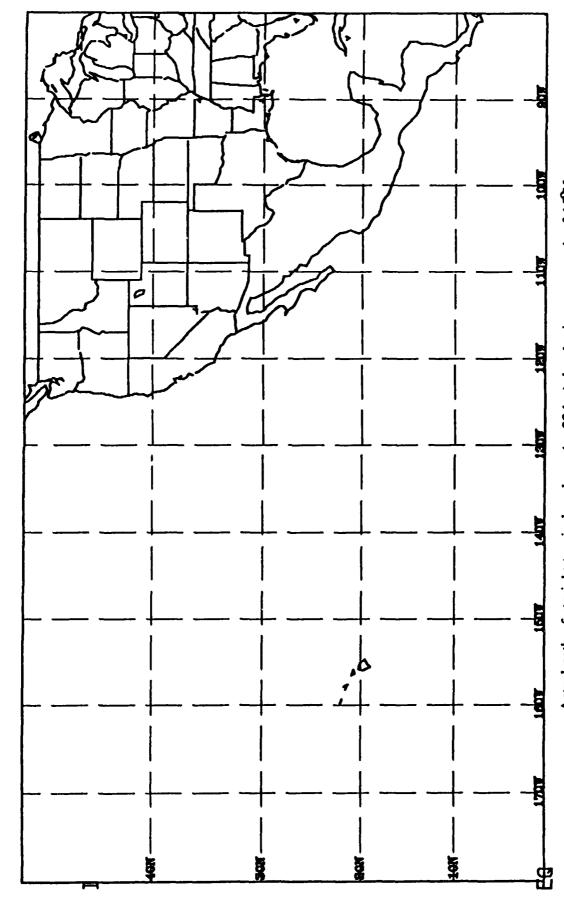
MEAN PATHS FOR MAR 9 - MAR 23

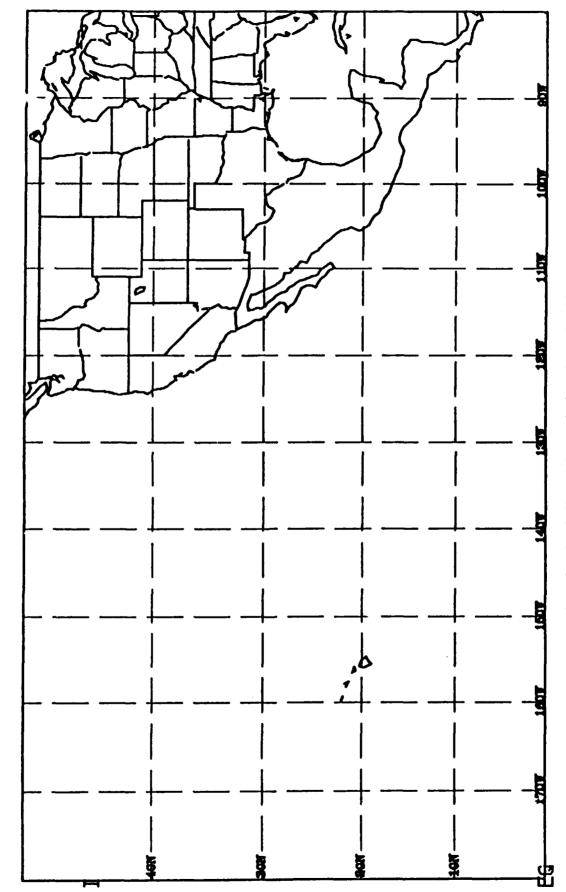


Numbers represent the percentage of tropical cyclones (> 33 kts) numbers may not add up to 100% since not all tropical cyclones develop/dissipate along a path. Tracks which contained less than develop/dissipate along a path. (> 33 kts) follow a mean path and some develop/dis 5% of the tropical cyclones (> 33 kts) are ignored. These Mean tropical cyclone (> 33 kts) path. which followed the indicated path.

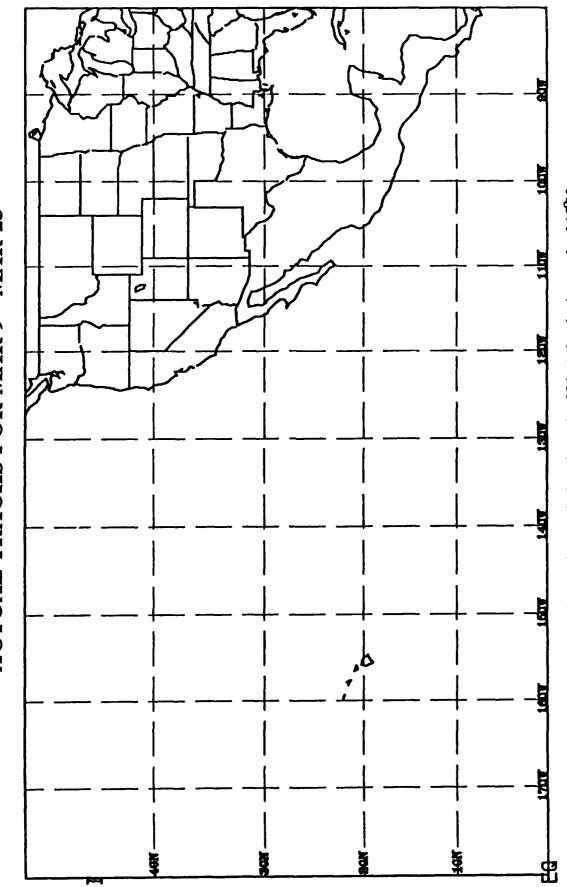


Actual path of straight tropical cyclones (> 33 kts) developing south of 15°N.



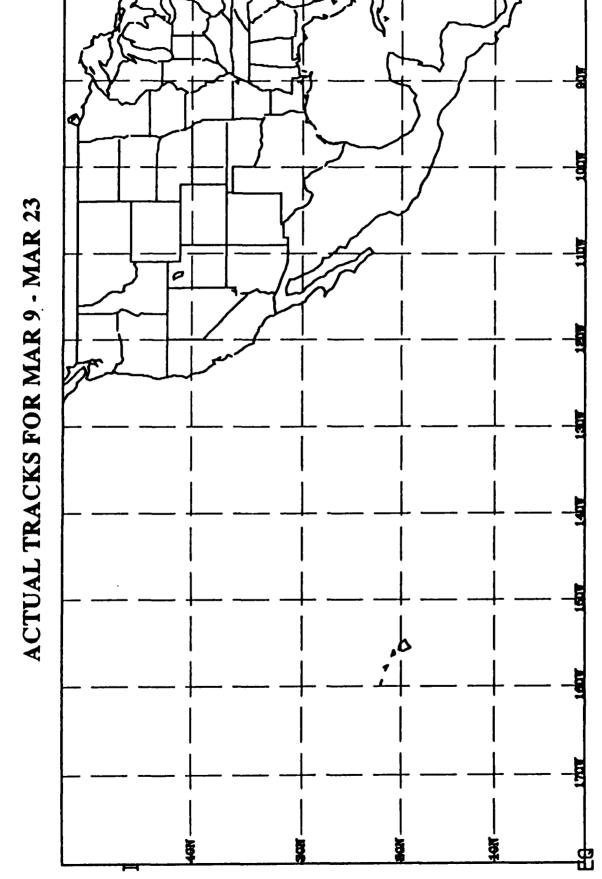


Actual path of all straight tropical cyclones (> 33 kts).

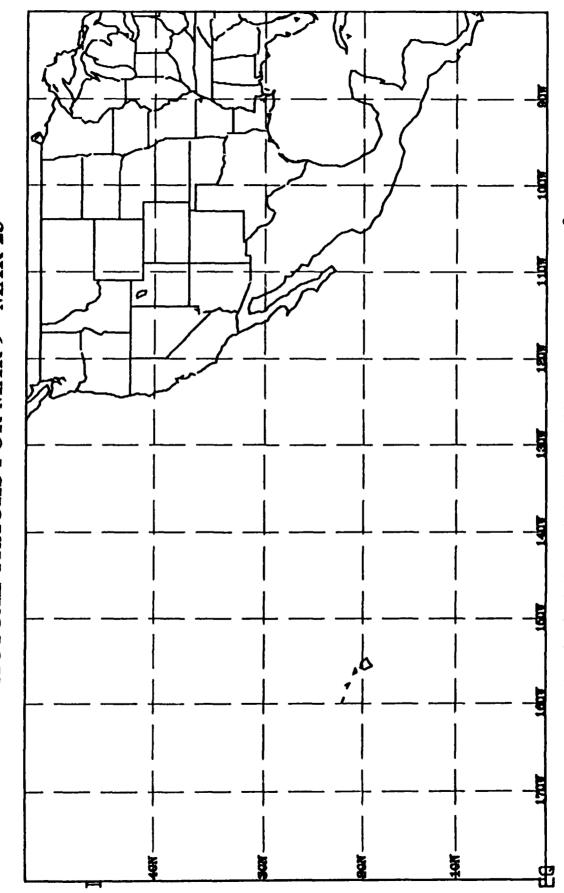


Actual path of recurving tropical cyclones (>33 kts) developing south of 150N.

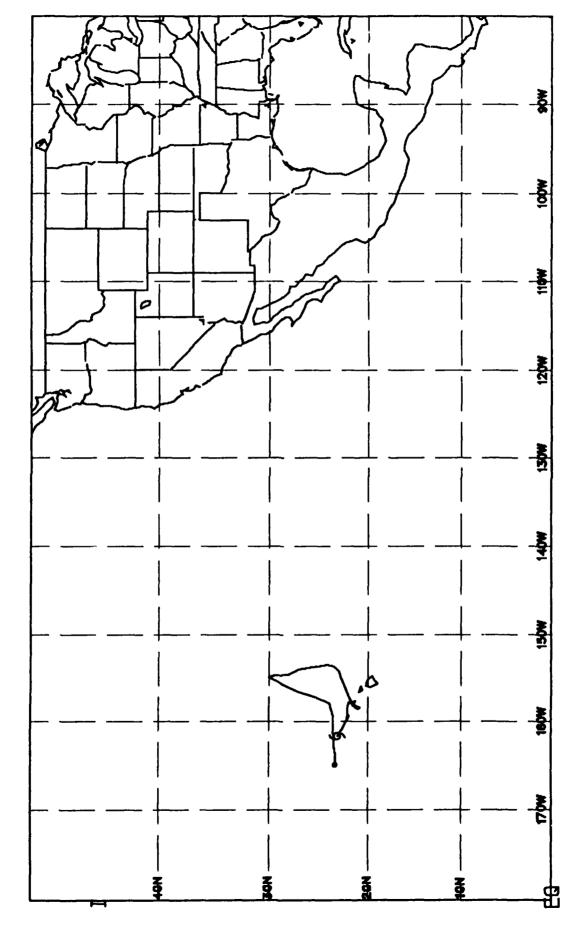
Actual path of recurving tropical cyclones (>33 kts) developing at or north of 15°N.



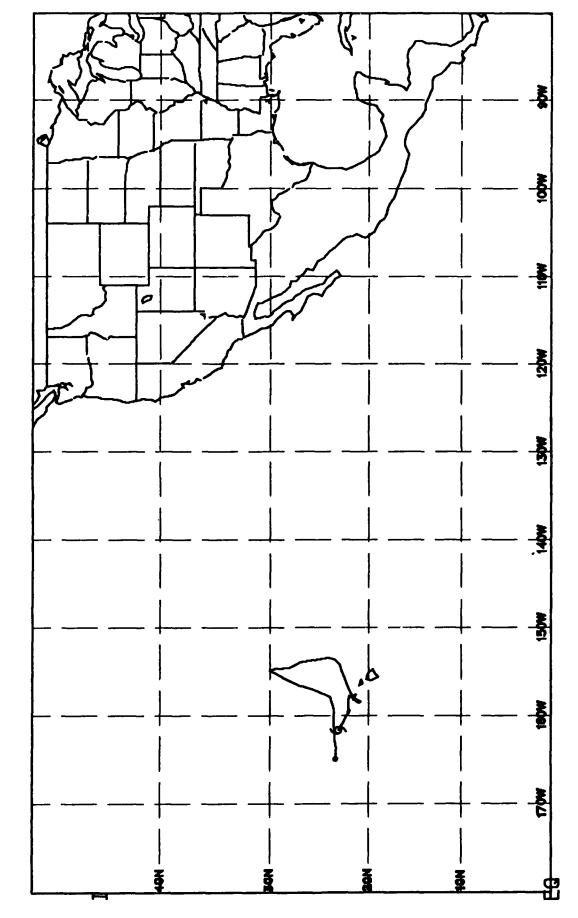
Actual path of all recurving tropical cyclones (>33 kts).



Actual path of other tropical cyclones (> 33 kts) developing south of 150N.

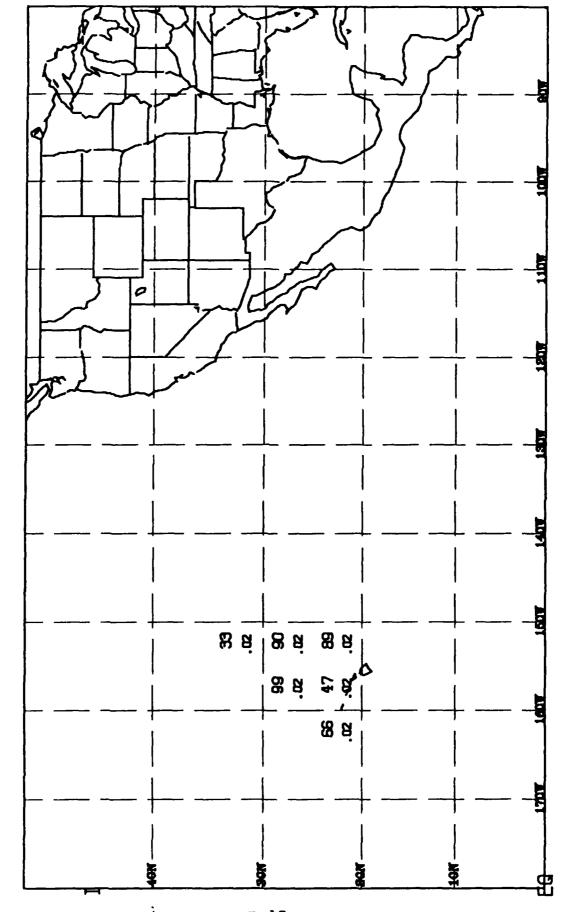


Actual path of other tropical cyclones (> 33 kts) developing at or north of 15°N.



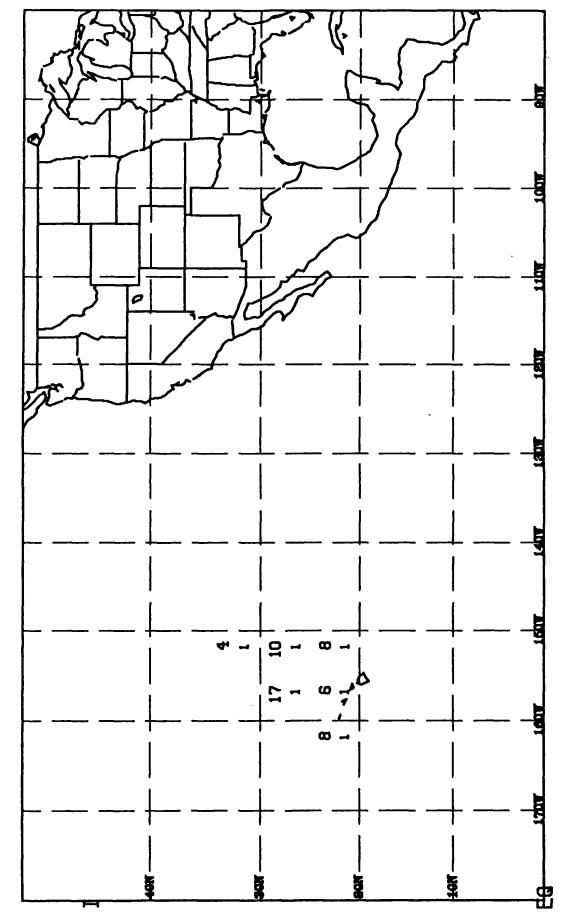
Actual path of all other tropical cyclones (>33 kts).

CONSTANCY AND RELATIVE FREQUENCY FOR MAR 9 - MAR 23



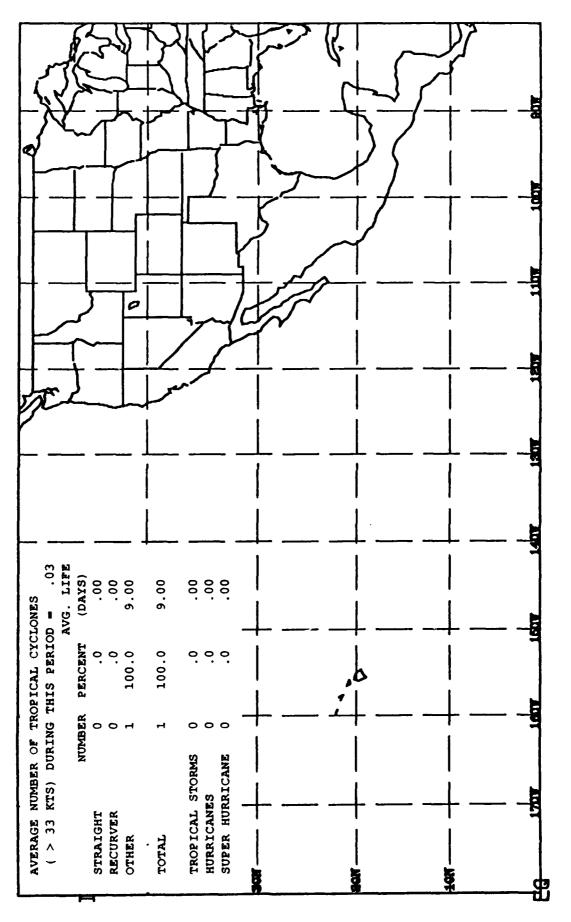
Tropical cyclone (> 33 kts) Constancy (top number) and Relative Frequency (bottom number). Constancy is defined as the 12-hr average vector speed divided by the 12-hr average scalar speed. Relative Frequency is the number of tropical cyclones passing through the 50 latitude by 50 longitude square per year per time period.

SPEED OF MOVEMENT FOR MAR 9 - MAR 23

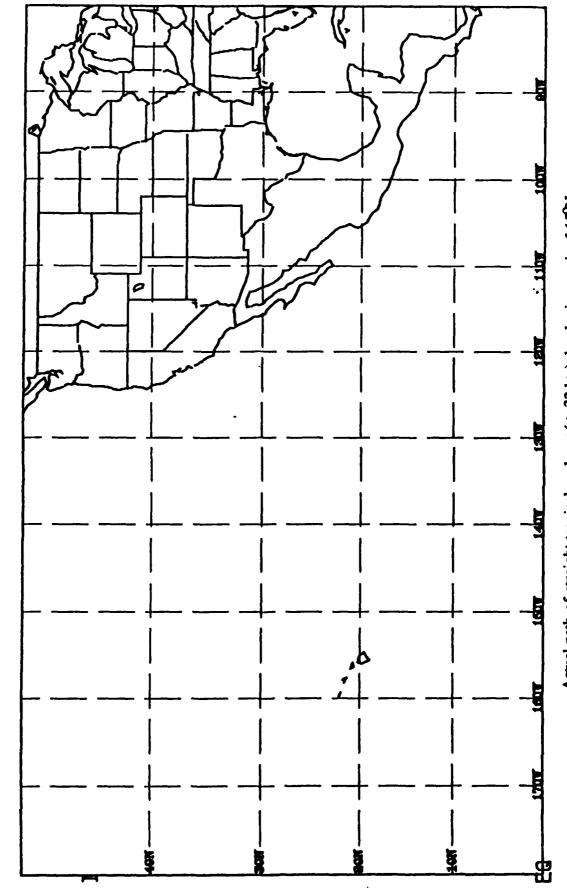


Average tropical cyclone (> 33 kts) Speed (top number) in knots and sample size (bottom number) for each 5° latitude by 5° longitude square. Contours are drawn only to those squares containing at least 5% of the sample.

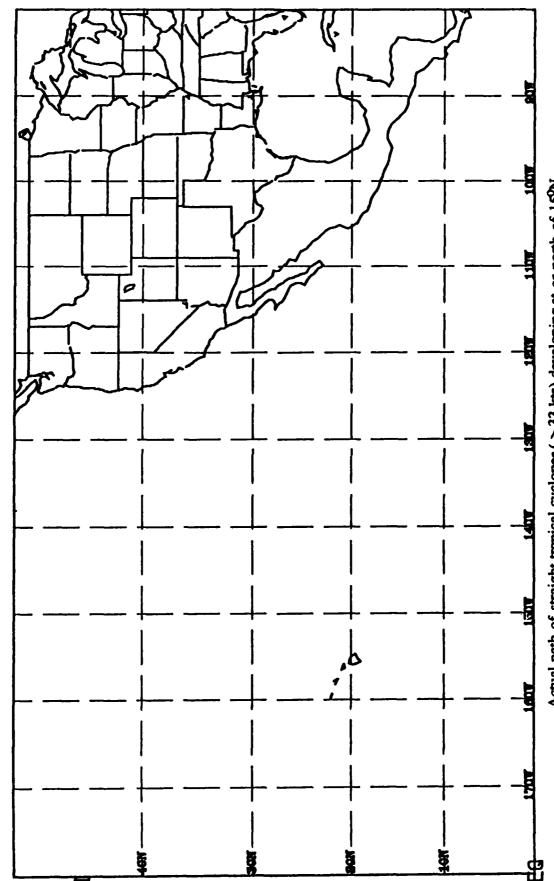
MEAN PATHS FOR MAR 24 - APR 8



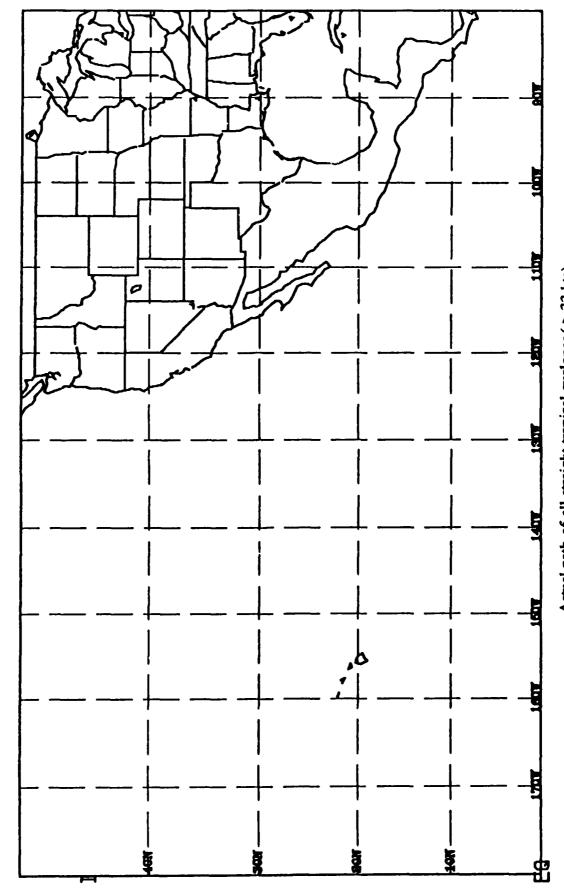
Numbers represent the percentage of tropical cyclones (> 33 kts) numbers may not add up to 100% since not all tropical cyclones Tracks which contained less than develop/dissipate along a path. 5% of the tropical cyclones (> 33 kts) are ignored. These (> 33 kts) follow a mean path and some Mean tropical cyclone (> 33 kts) path. which followed the indicated path.



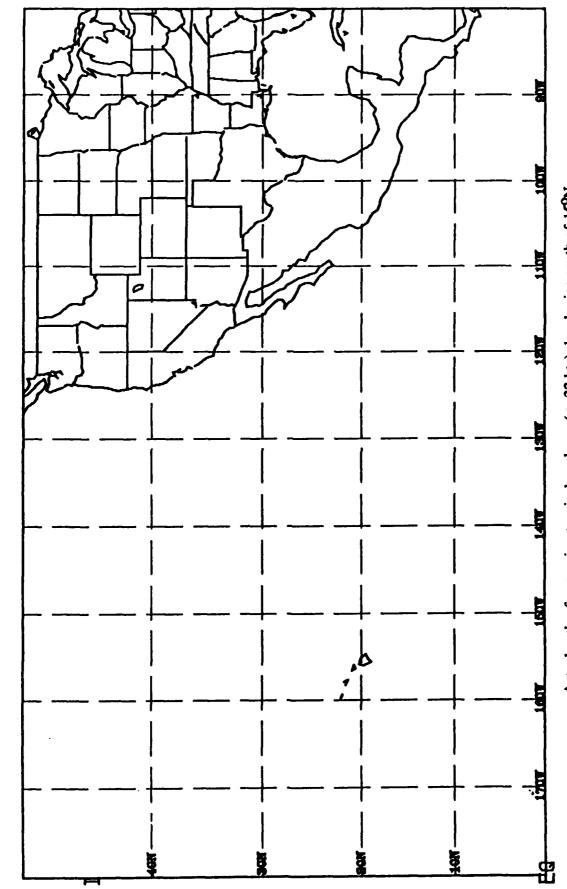
Actual path of straight tropical cyclones (>33 kts) developing south of 15°N.



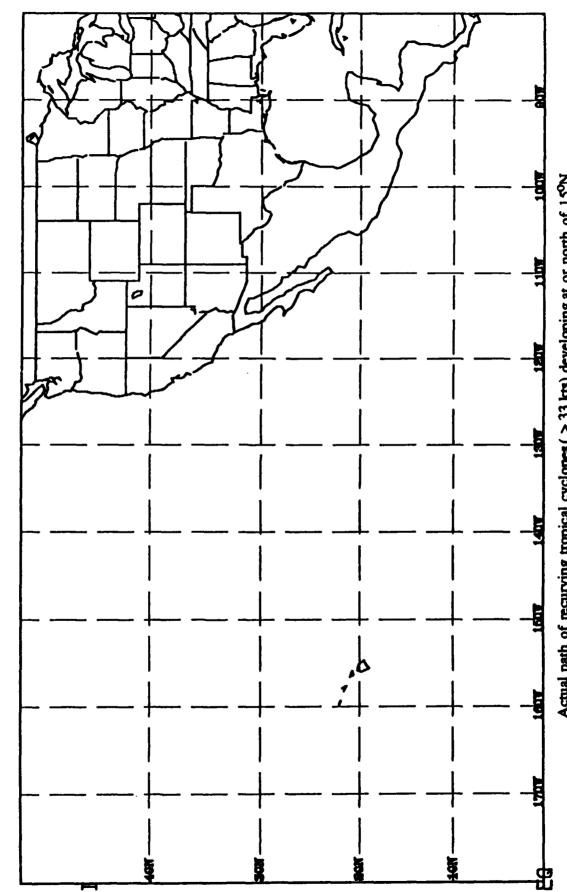
Actual path of straight tropical cyclones (>33 kts) developing at or north of 15°N.



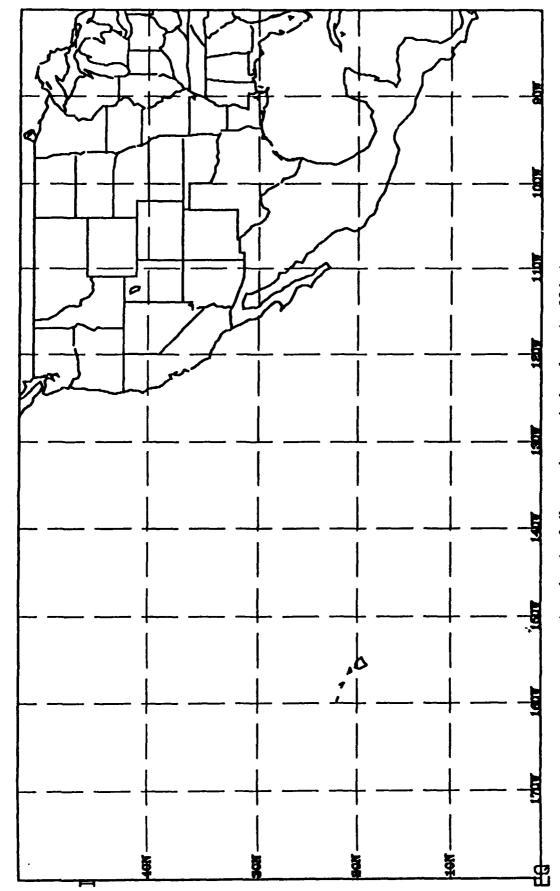
Actual path of all straight tropical cyclones (>33 kts).



Actual path of recurving tropical cyclones (>33 kts) developing south of 15°N.

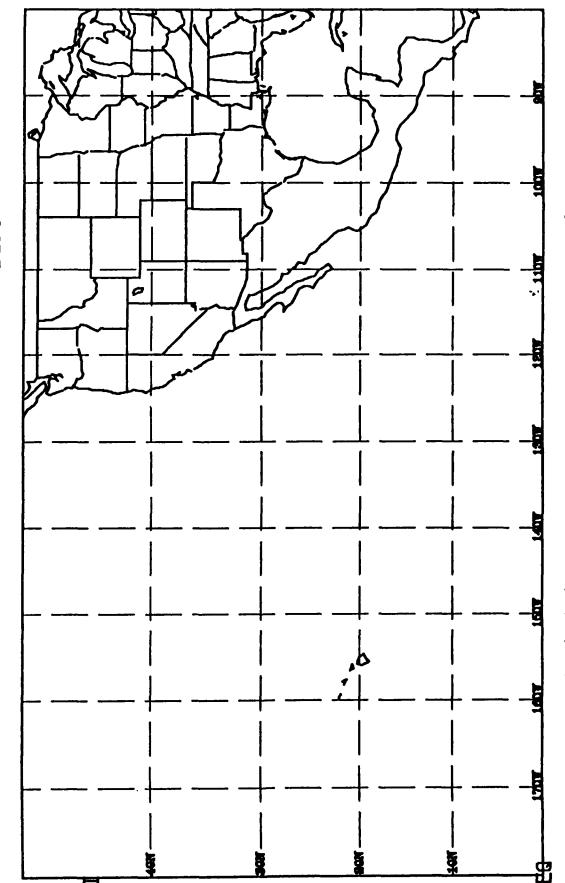


Actual path of recurving tropical cyclones (>33 kts) developing at or north of 15°N.



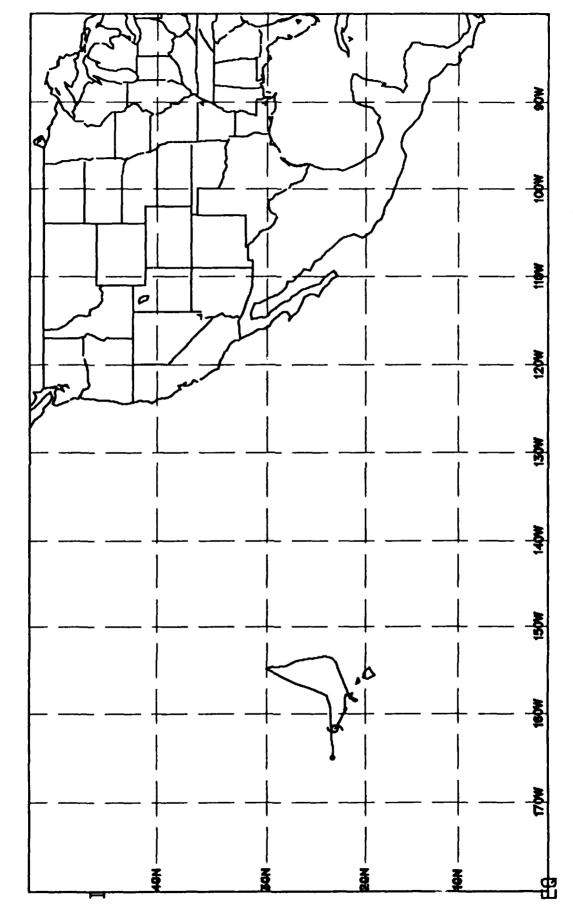
Actual path of all recurving tropical cyclones (>33 kts).

ACTUAL TRACKS FOR MAR 24 - APR 8



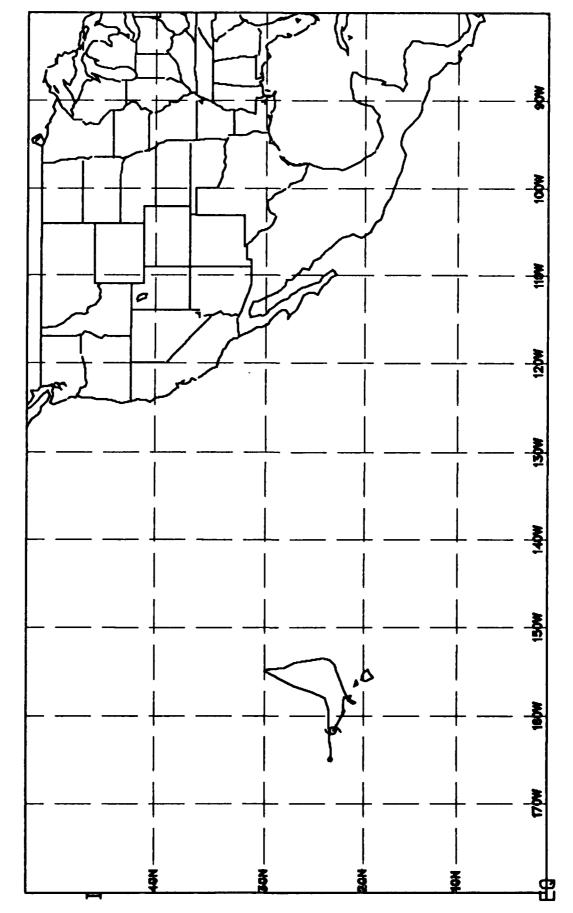
Actual path of other tropical cyclones (>33 kts) developing south of 150N.

ACTUAL TRACKS FOR MAR 24 - APR 8



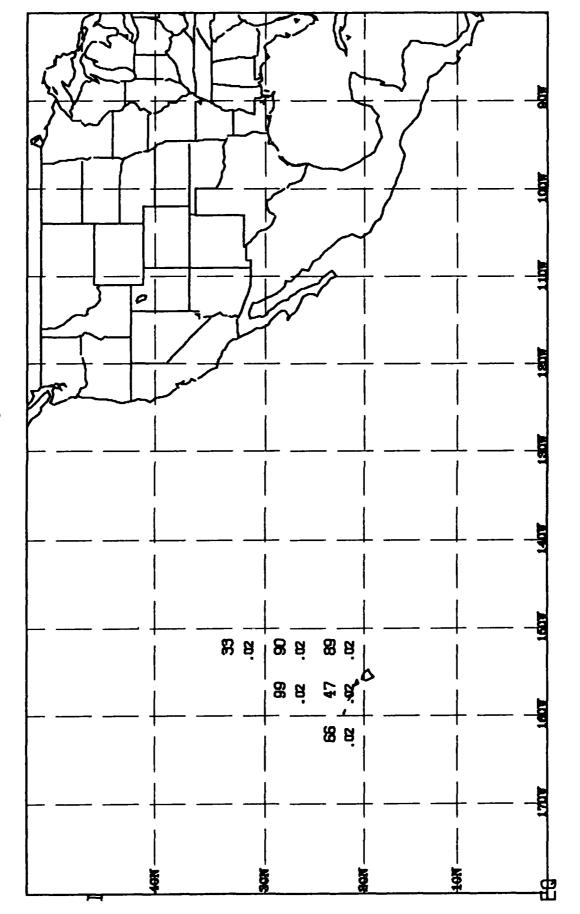
Actual path of other tropical cyclones (> 33 kts) developing at or north of 159N.

ACTUAL TRACKS FOR MAR 24 - APR 8



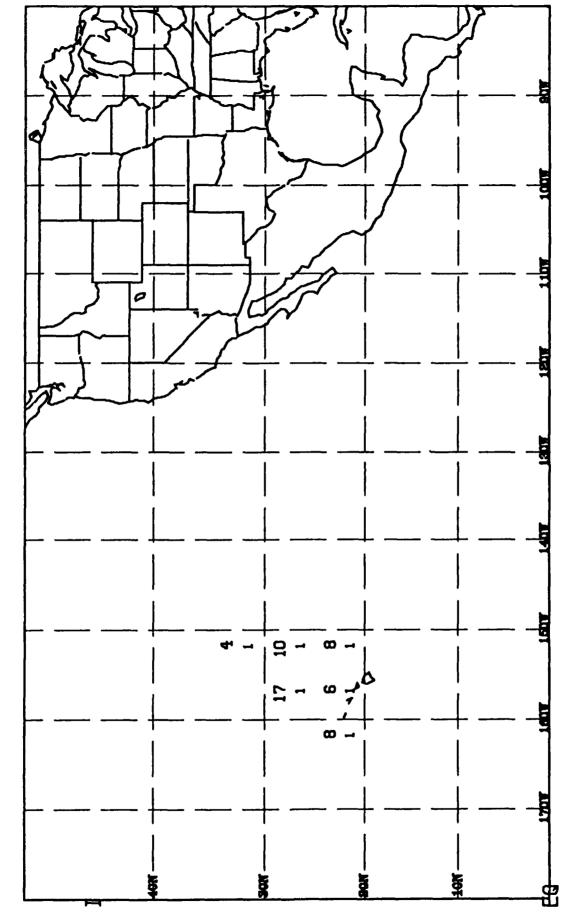
Actual path of all other tropical cyclones (>33 kts).

CONSTANCY AND RELATIVE FREQUENCY FOR MAR 24 - APR 8



s 33 kts) Constancy (top number) and Relative Frequency (bottom number). as the 12-hr average vector speed divided by the 12-hr average scalar speed. s the number of tropical cyclones passing through the 50 latitude by 50 Constancy is defined as the 12-hr ave Relative Frequency is the number o longitude square per year per time period. cyclone Tropical

SPEED OF MOVEMENT FOR MAR 24 - APR 8



(> 33 kts) Speed (top number) in knots and sample size (bottom number) for longitude square. Contours are drawn only to those squares containing at Average tropical cyclone each 5° latitude by 5° least 5% of the sample.

NO TROPICAL CYCLONES-DURING THIS PERIOD **APR 9 - APR 23**

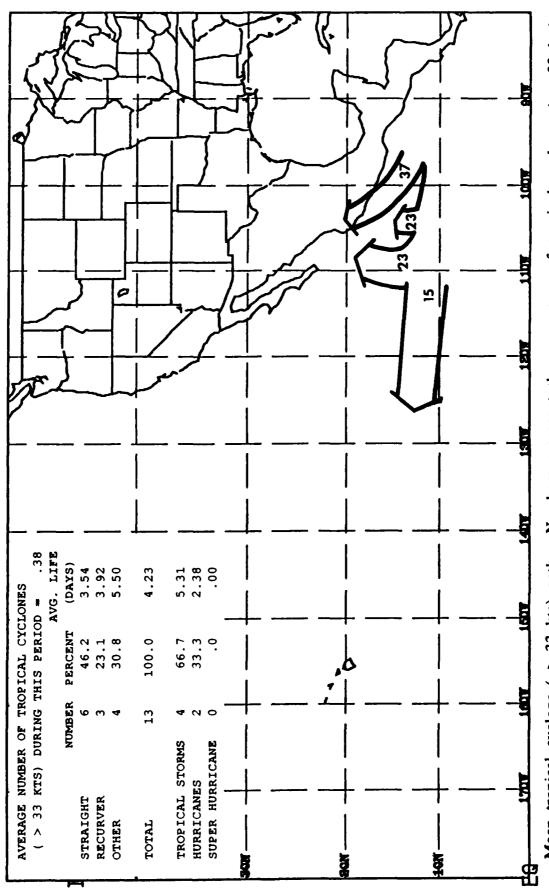
E-31

NO TROPICAL CYCLONES-0 DURING THIS PERIOD

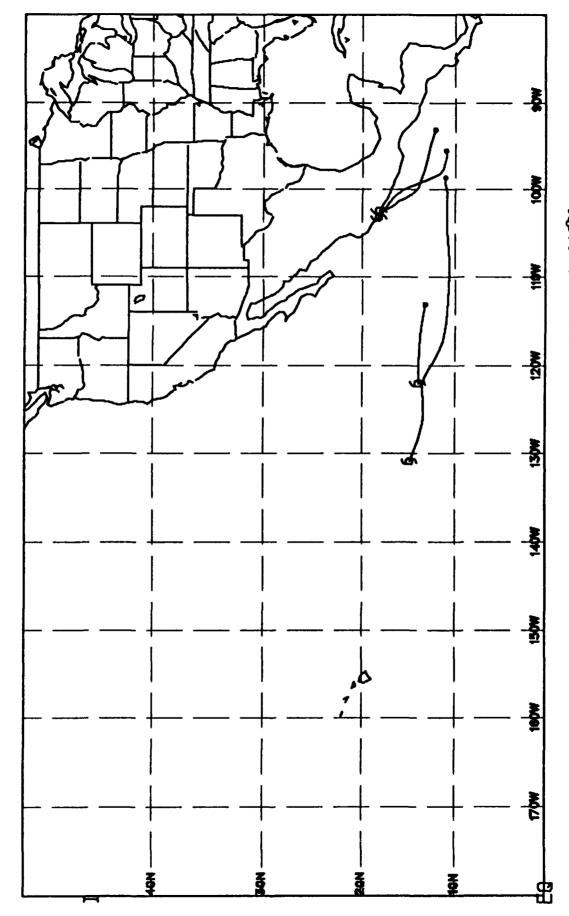
APR 24 - MAY 8

E-32

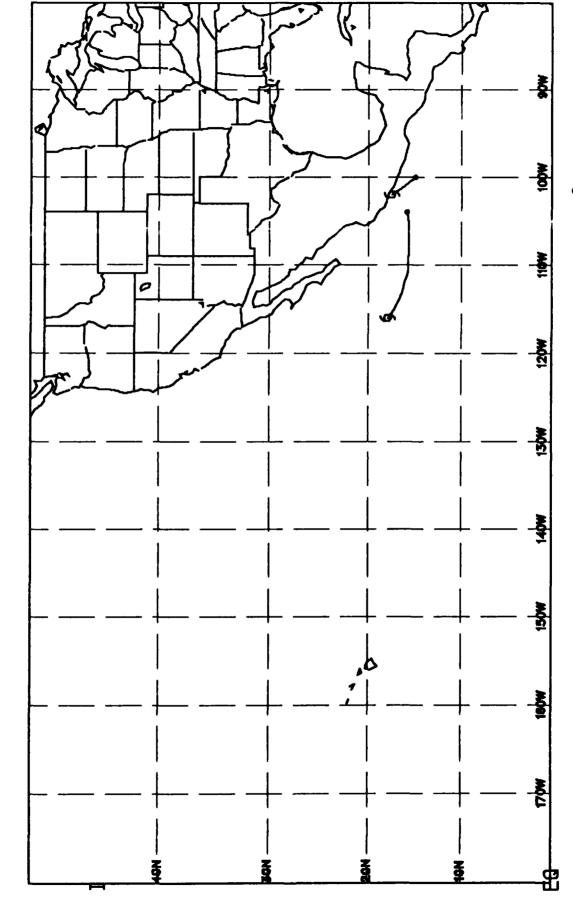
MEAN PATHS FOR MAY 9 - MAY 23



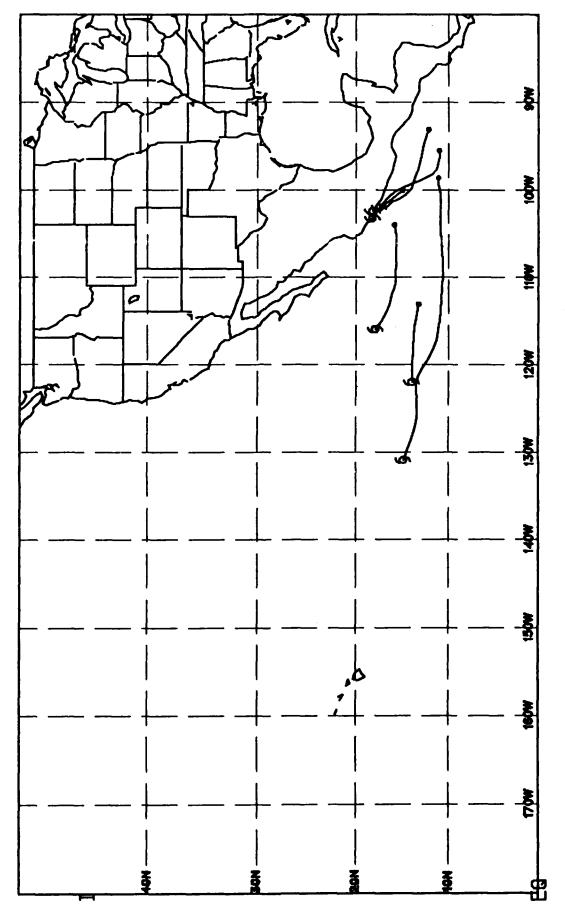
Numbers represent the percentage of tropical cyclones (> 33 kts) numbers may not add up to 100% since not all tropical cyclones develop/dissipate along a path. Tracks which contained less than (> 33 kts) follow a mean path and some develop/dis 5% of the tropical cyclones (> 33 kts) are ignored. Mean tropical cyclone (> 33 kts) path. I which followed the indicated path. These



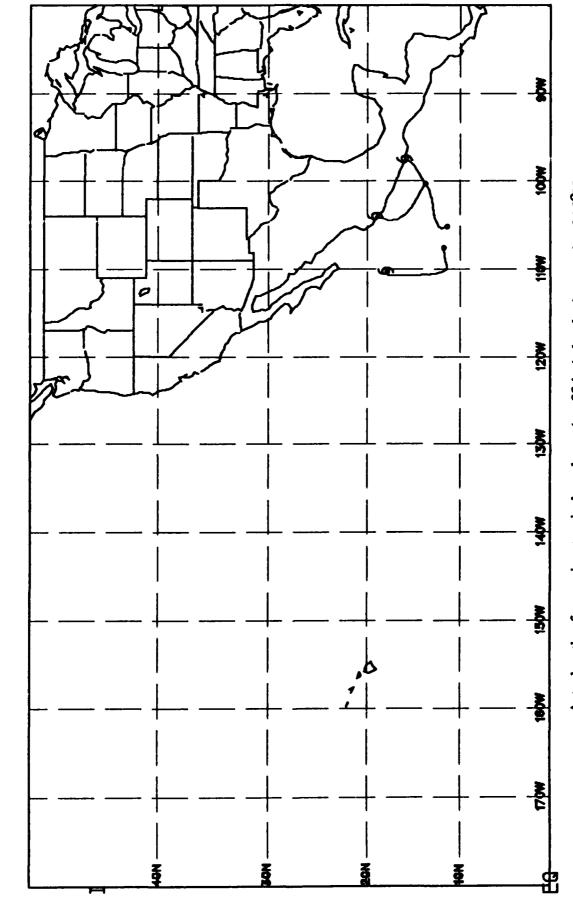
Actual path of straight tropical cyclones (> 33 kts) developing south of 15°N.



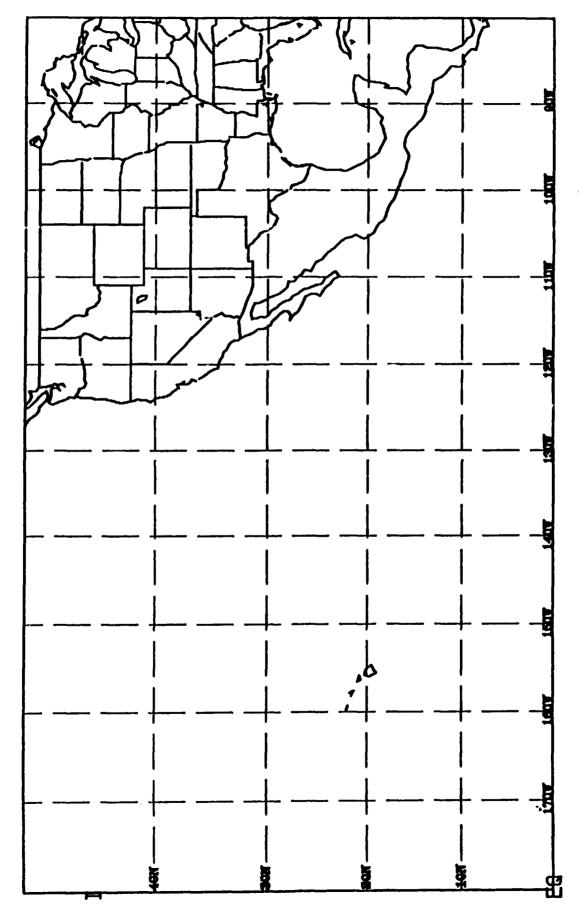
Actual path of straight tropical cyclones (> 33 kts) developing at or north of 15°N.



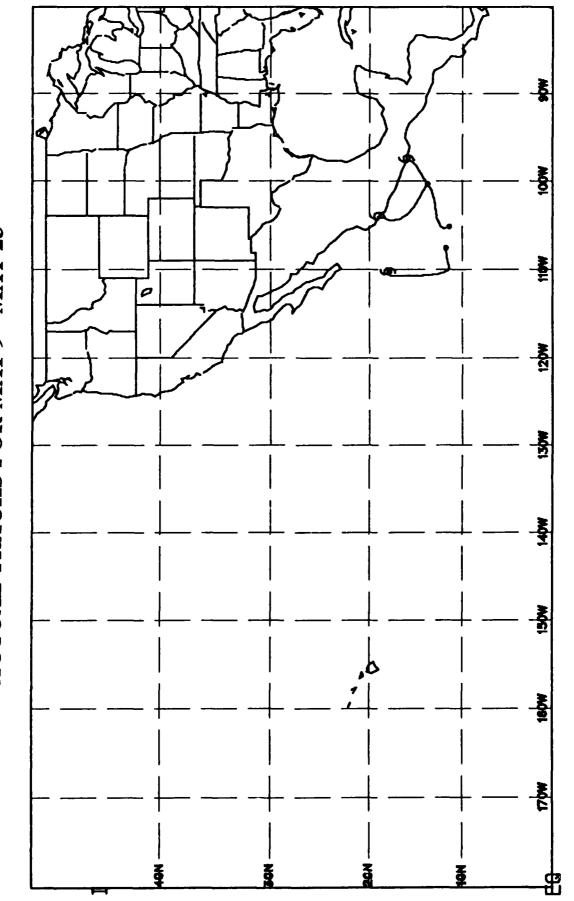
Actual path of all straight tropical cyclones (>33 kts).



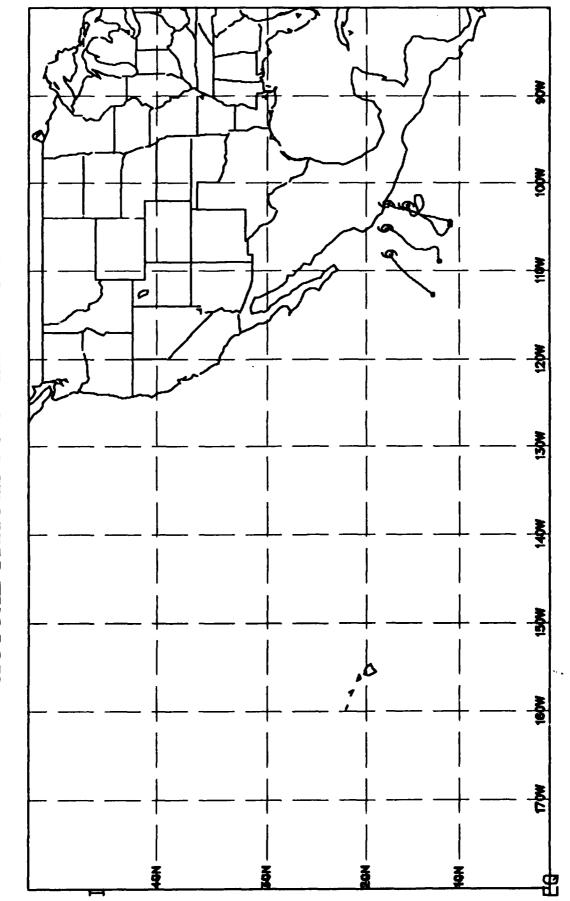
Actual path of recurving tropical cyclones (> 33 kts) developing south of 15°N.



Actual path of recurving tropical cyclones (> 33 kts) developing at or north of 15°N.



Actual path of all recurving tropical cyclones (> 33 kts).

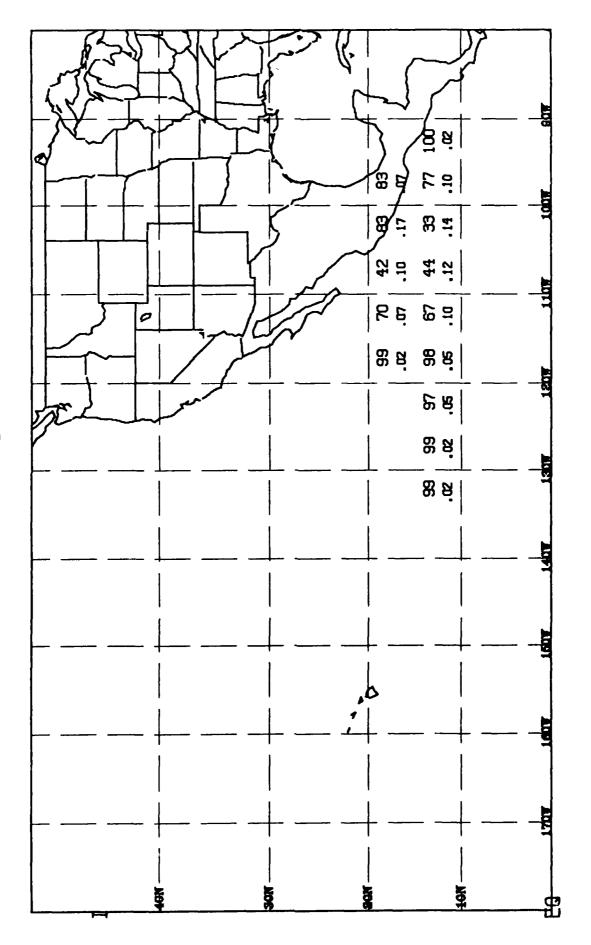


Actual path of other tropical cyclones (>33 kts) developing south of 159N.

Actual path of other tropical cyclones (>33 kts) developing at or north of 15°N.

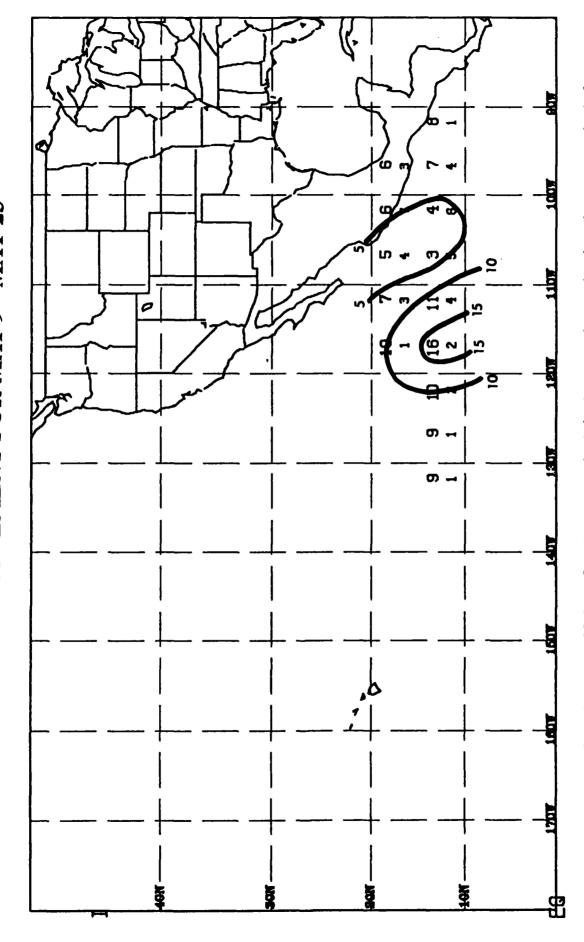
Actual path of all other tropical cyclones (> 33 kts).

CONSTANCY AND RELATIVE FREQUENCY FOR MAY 9 - MAY 23



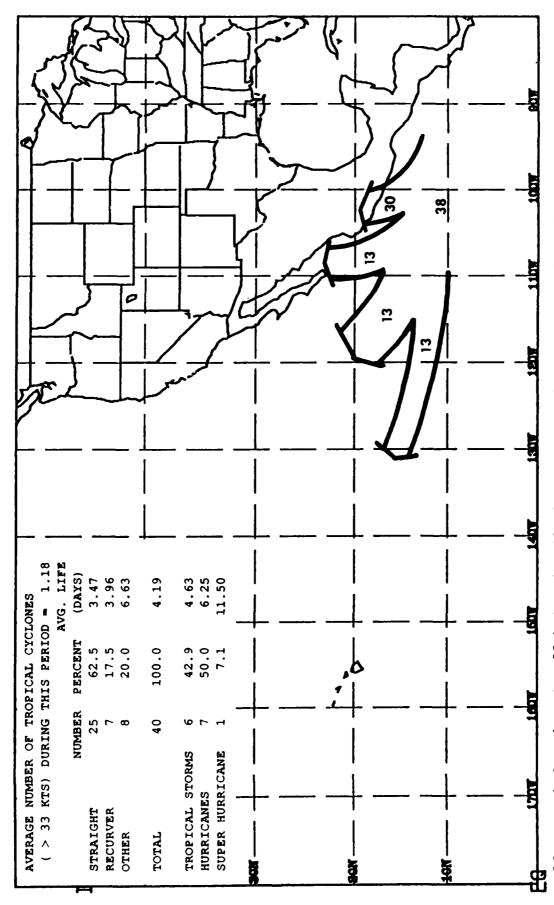
as the 12-hr average vector speed divided by the 12-hr average scalar speed. and Relative Frequency (bottom number). 33 kts) Constancy (top number) Constancy is defined as the 12-hr ave Relative Frequency is the number of longitude square per year per time period. Tropical cyclone (

SPEED OF MOVEMENT FOR MAY 9 - MAY 23

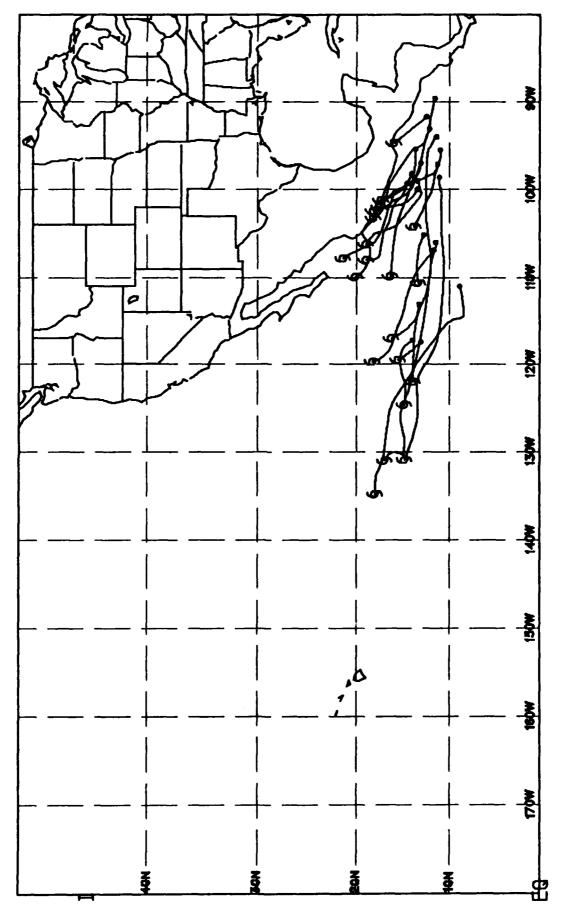


Average tropical cyclone (> 33 kts) Speed (top number) in knots and sample size (bottom number) for each 5° latitude by 5° longitude square. Contours are drawn only to those squares containing at least 5% of the sample.

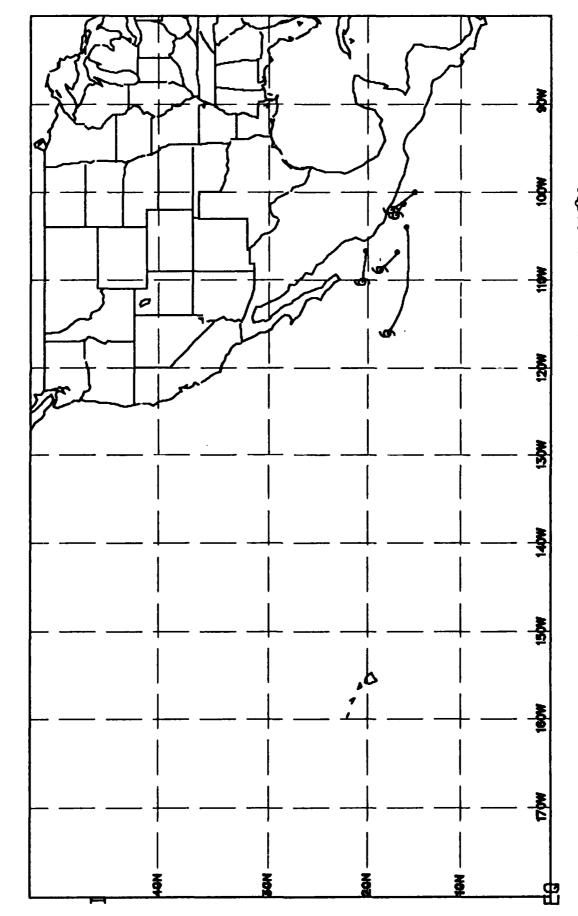
MEAN PATHS FOR MAY 24 - JUN 8



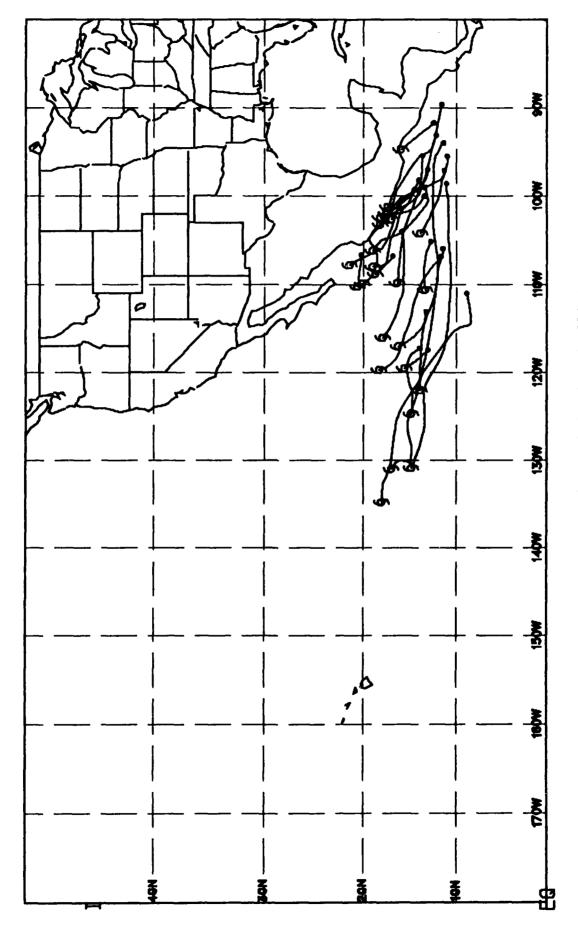
Numbers represent the percentage of tropical cyclones (> 33 kts) numbers may not add up to 100% since not all tropical cyclones develop/dissipate along a path. Tracks which contained less than (> 33 kts) follow a mean path and some develop/dii 5% of the tropical cyclones (> 33 kts) are ignored. Mean tropical cyclone (> 33 kts) path. which followed the indicated path. These



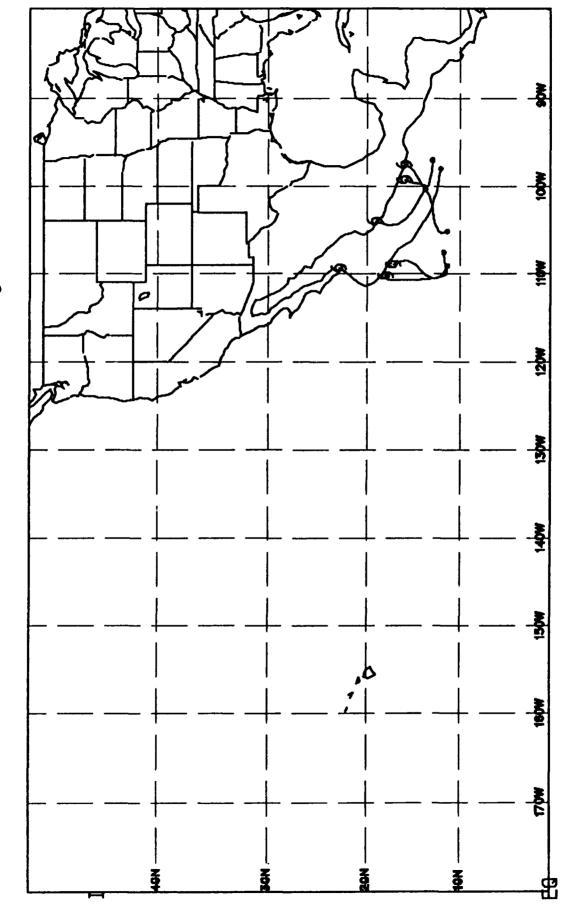
Actual path of straight tropical cyclones (> 33 kts) developing south of 15°N.



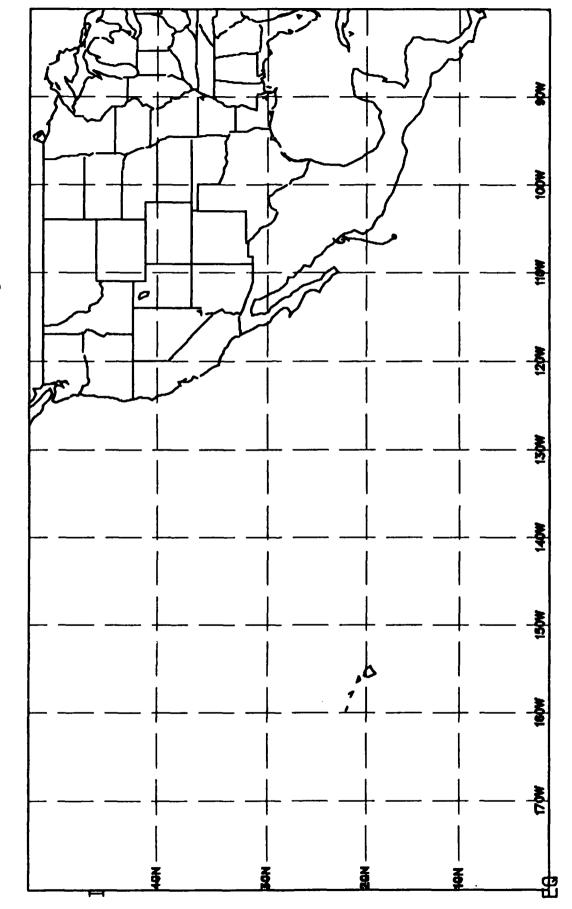
Actual path of straight tropical cyclones (> 33 kts) developing at or north of 15°N.



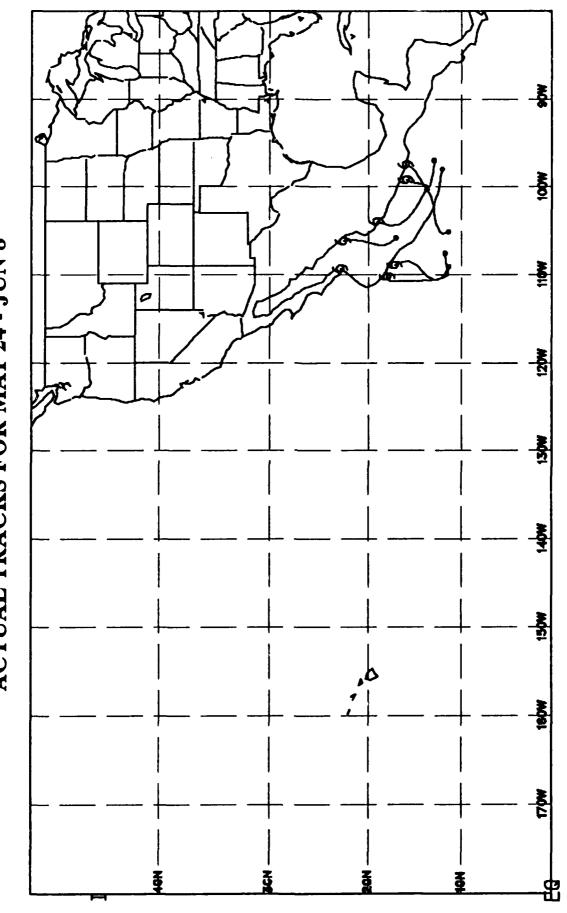
Actual path of all straight tropical cyclones (> 33 kts).



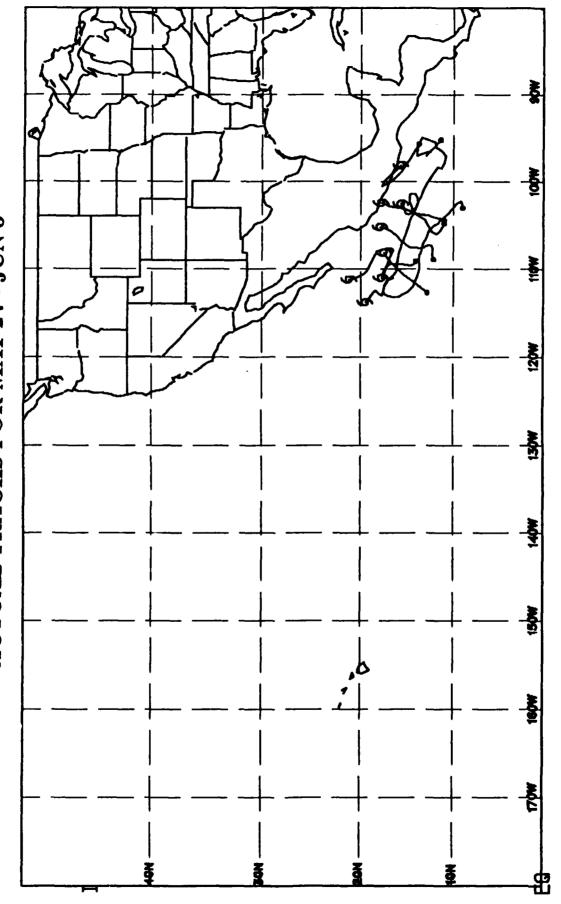
Actual path of recurving tropical cyclones (> 33 kts) developing south of 15°N.



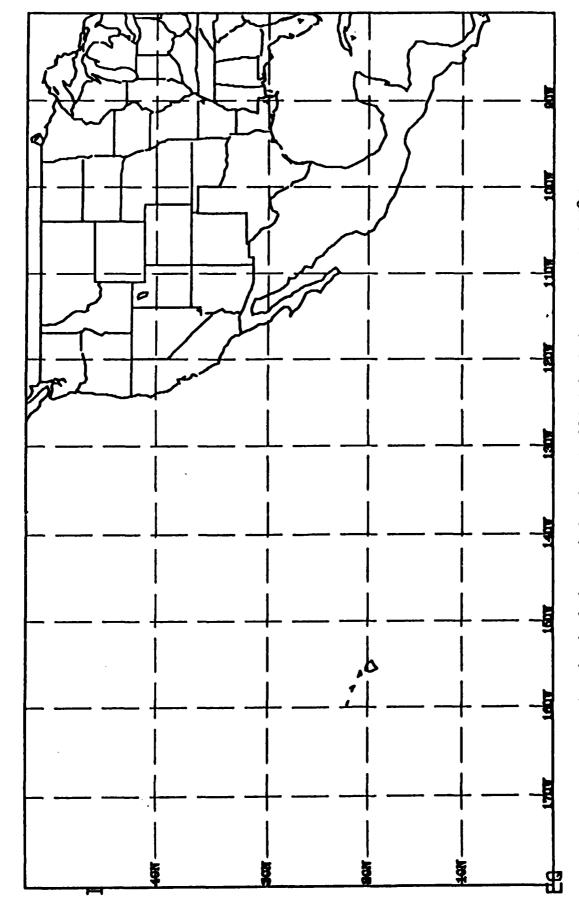
Actual path of recurving tropical cyclones (> 33 kts) developing at or north of 15°N.



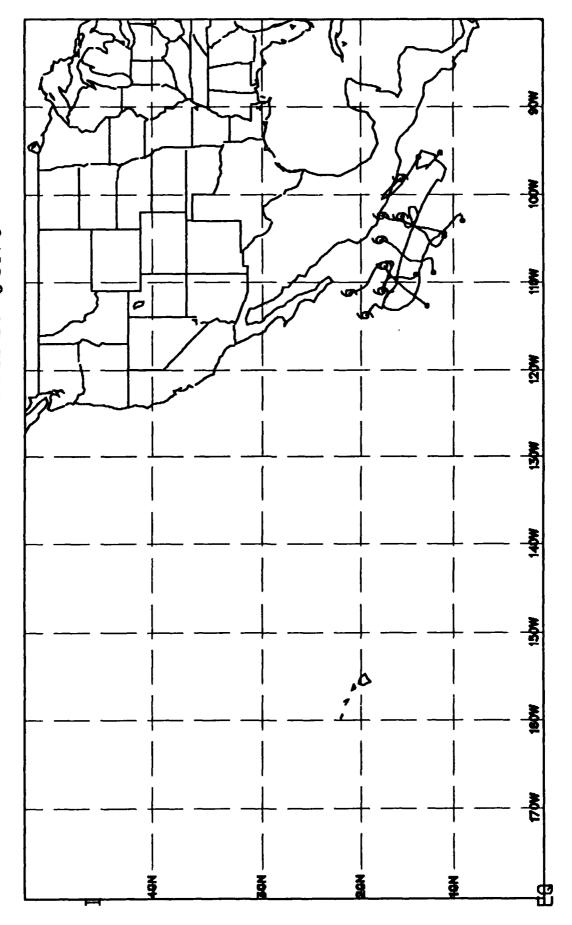
Actual path of all recurving tropical cyclones (> 33 kts).



Actual path of other tropical cyclones (>33 kts) developing south of 15°N.

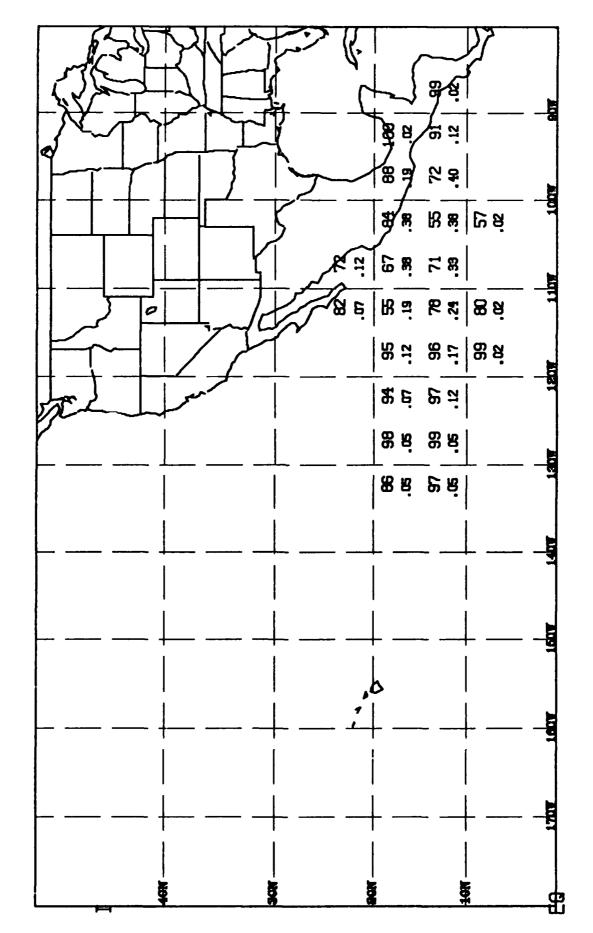


Actual path of other tropical cyclones (> 33 kts) developing at or north of 15°N.



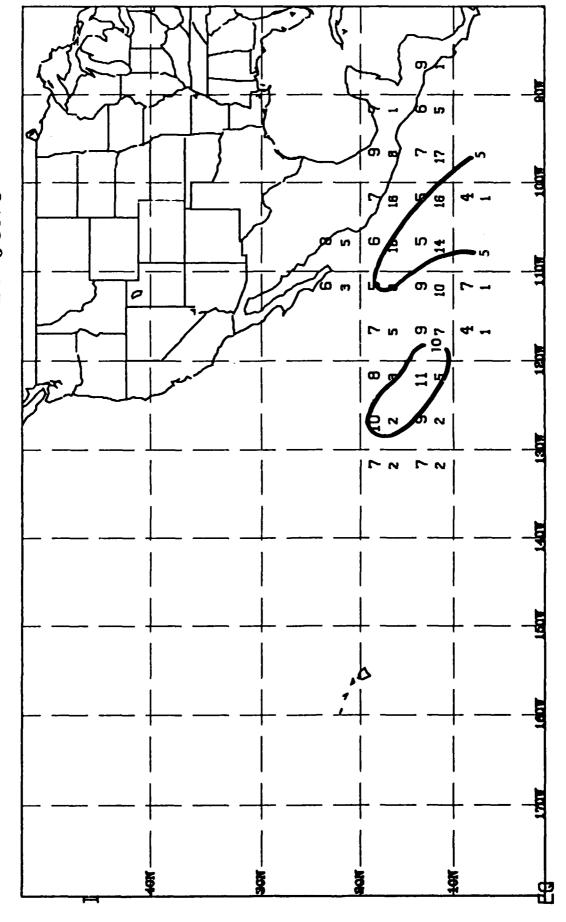
Actual path of all other tropical cyclones (>33 kts).

CONSTANCY AND RELATIVE FREQUENCY FOR MAY 24 - JUN 8



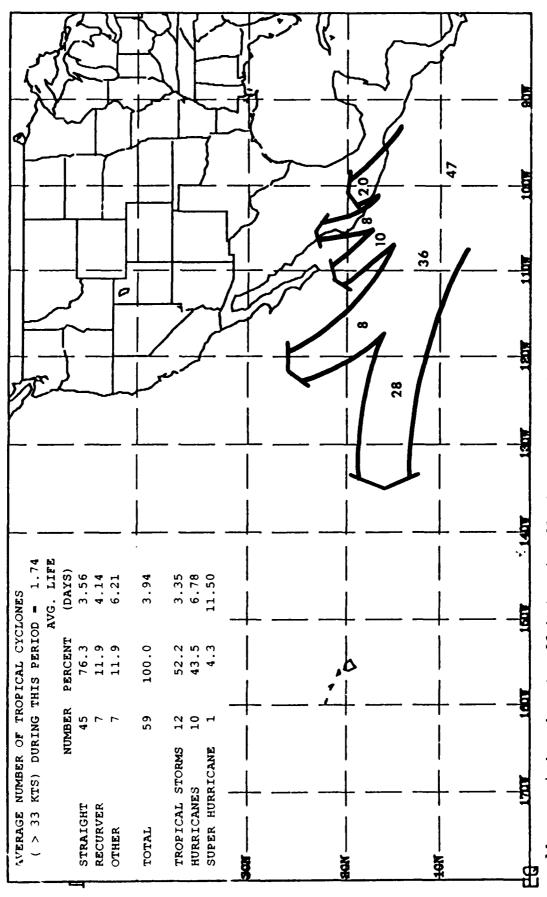
Tropical cyclone (> 33 kts) Constancy (top number) and Relative Frequency (bottom number). Constancy is defined as the 12-hr average vector speed divided by the 12-hr average scalar speed. Relative Frequency is the number of tropical cyclones passing through the 50 latitude by 50 longitude square per year per time period.

SPEED OF MOVEMENT FOR MAY 24 - JUN 8



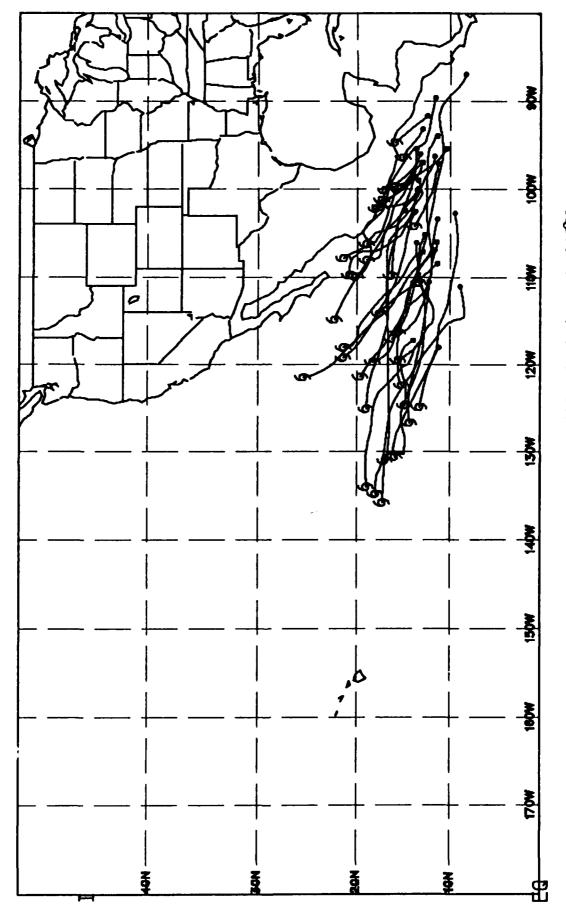
Average tropical cyclone (> 33 kts) Speed (top number) in knots and sample size (bottom number) for each 5° latitude by 5° longitude square. Contours are drawn only to those squares containing at least 5% of the sample.

MEAN PATHS FOR JUN 9 - JUN 23

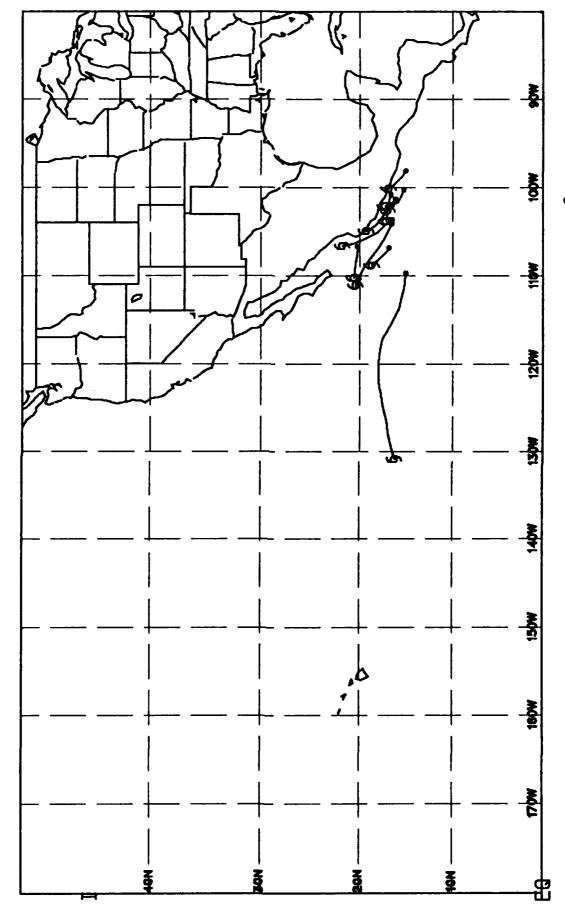


Numbers represent the percentage of tropical cyclones (> 33 kts) numbers may not add up to 100% since not all tropical cyclones develop/dissipate along a path. Tracks which contained less than (> 33 kts) follow a mean path and some develop/dis 5% of the tropical cyclones (> 33 kts) are ignored. These Mean tropical cyclone (> 33 kts) path. which followed the indicated path.

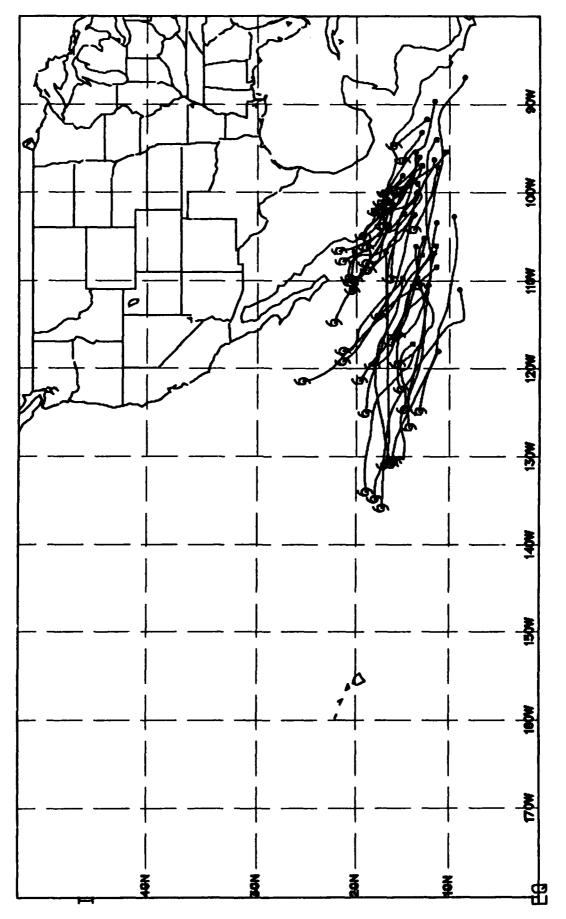
E-57



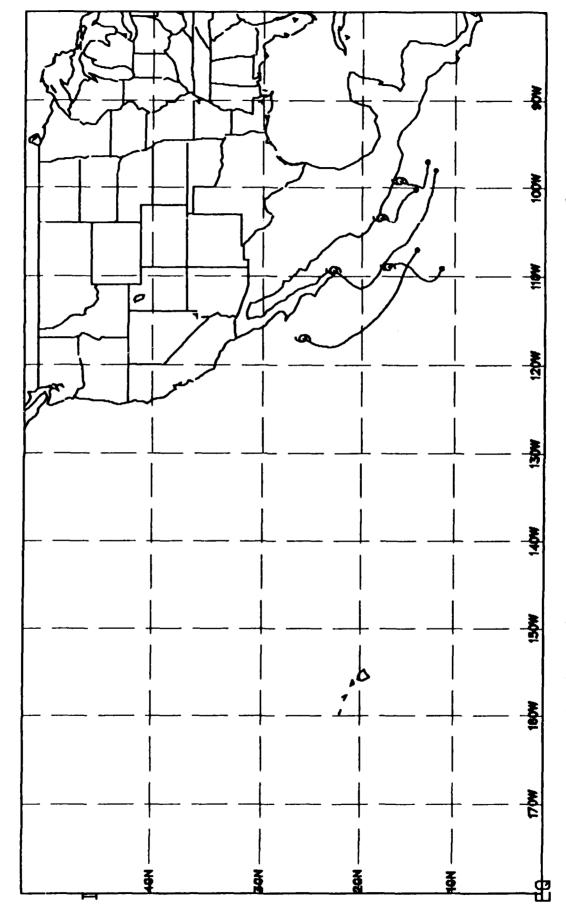
Actual path of straight tropical cyclones (> 33 kts) developing south of 15°N.



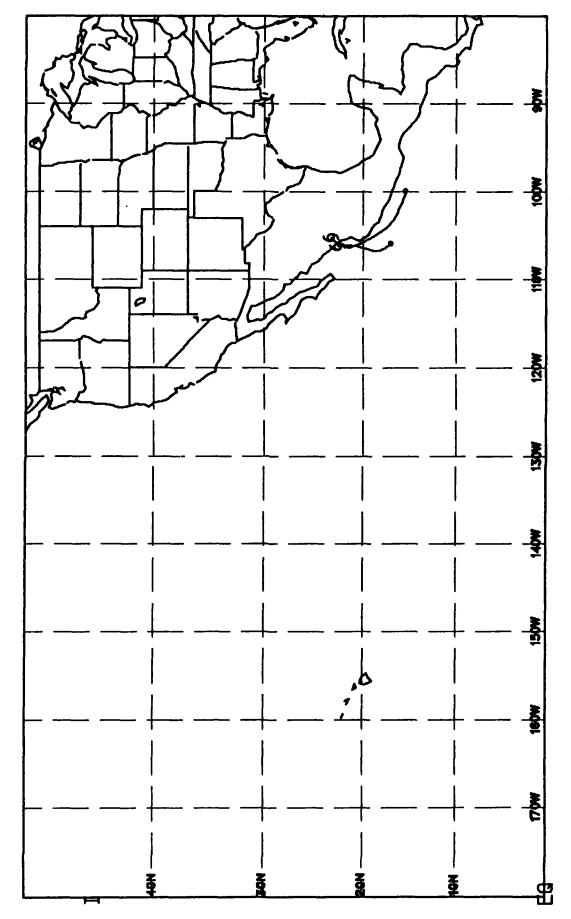
Actual path of straight tropical cyclones (>33 kts) developing at or north of 150N.



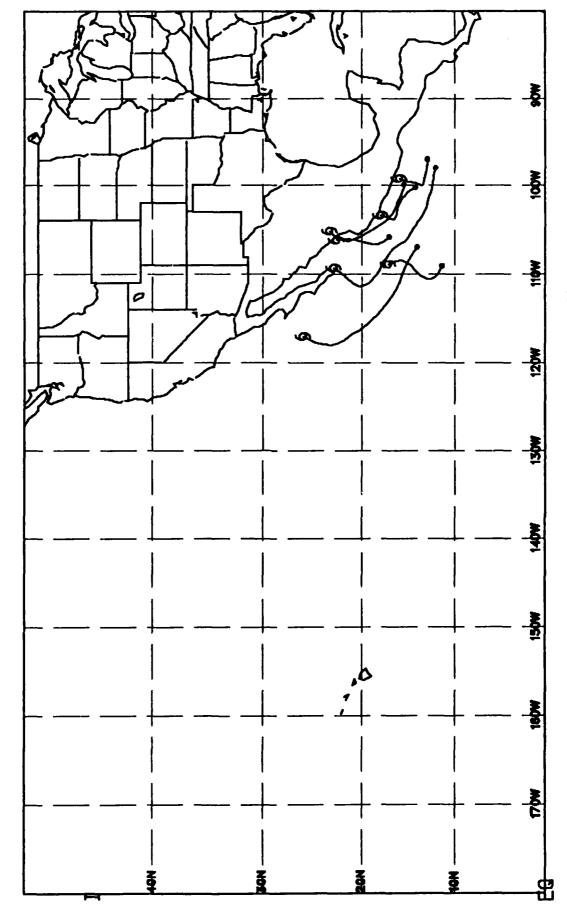
Actual path of all straight tropical cyclones (> 33 kts).



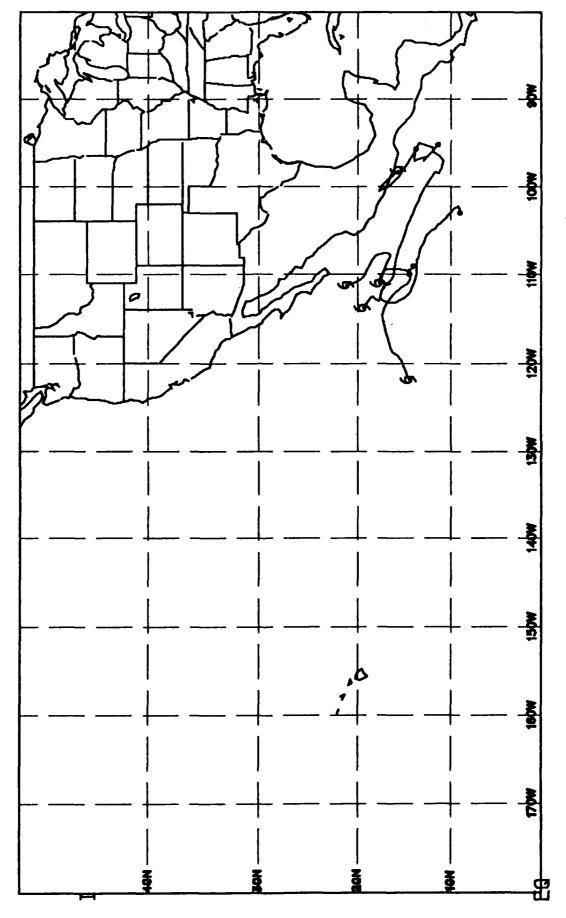
Actual path of recurving tropical cyclones (> 33 kts) developing south of 15°N.



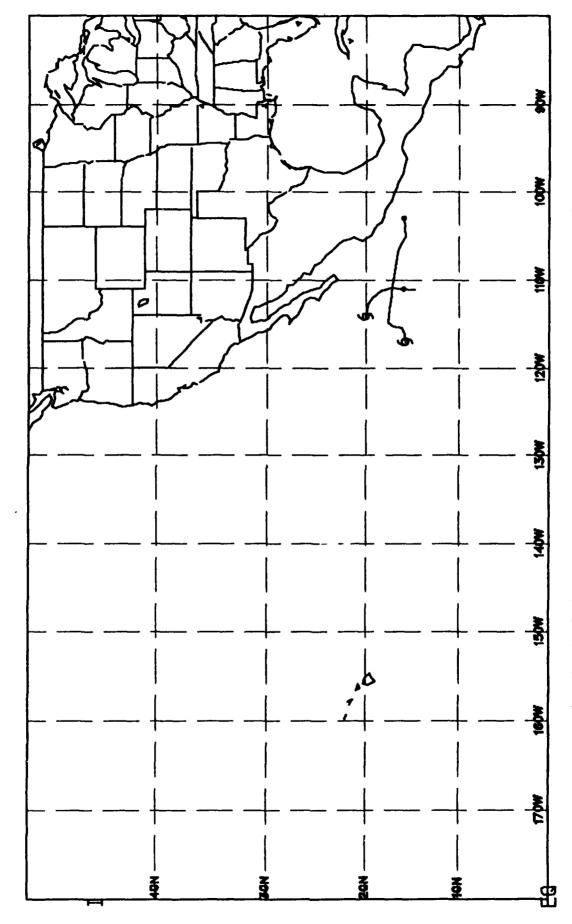
Actual path of recurving tropical cyclones (>33 kts) developing at or north of 159N.



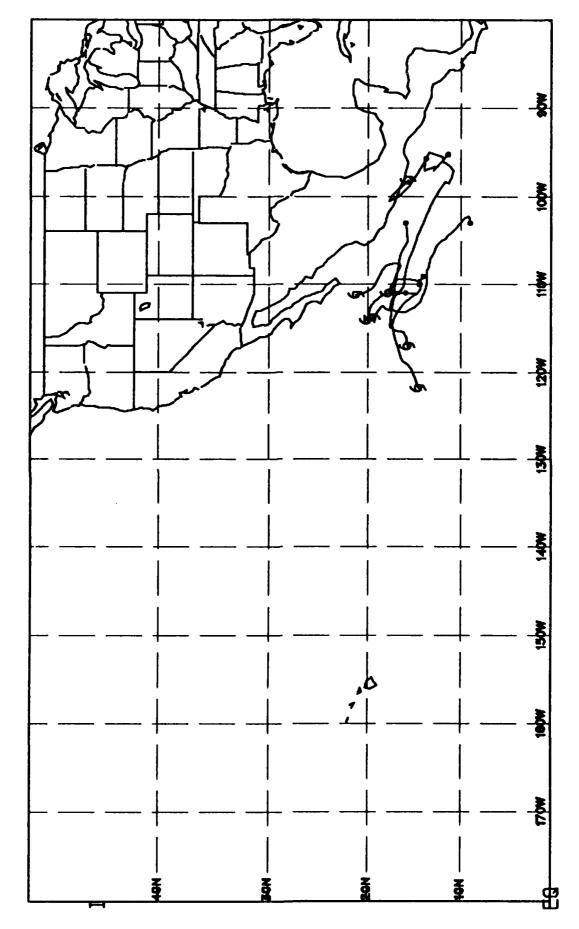
Actual path of all recurving tropical cyclones (> 33 kts).



Actual path of other tropical cyclones (> 33 kts) developing south of 150N.

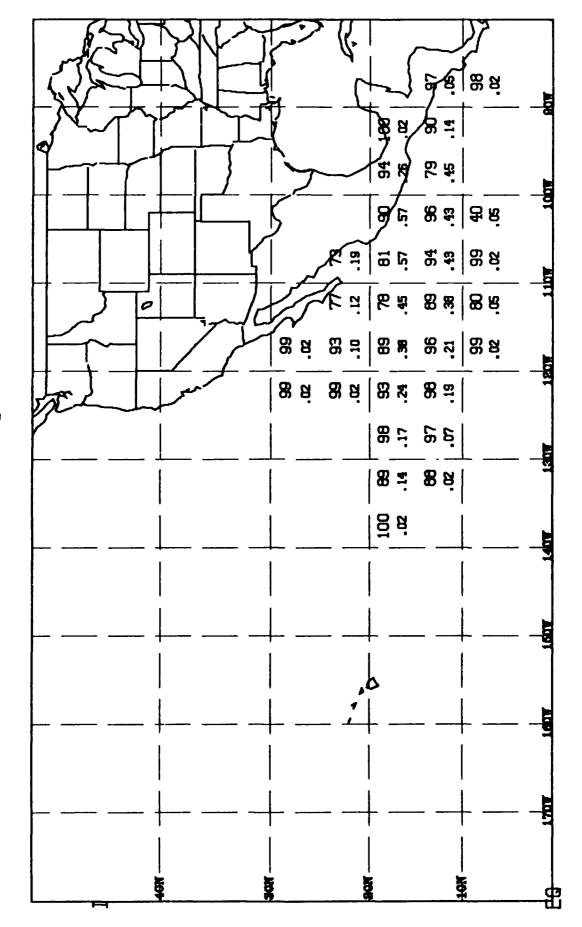


Actual path of other tropical cyclones (>33 kts) developing at or north of 159N.



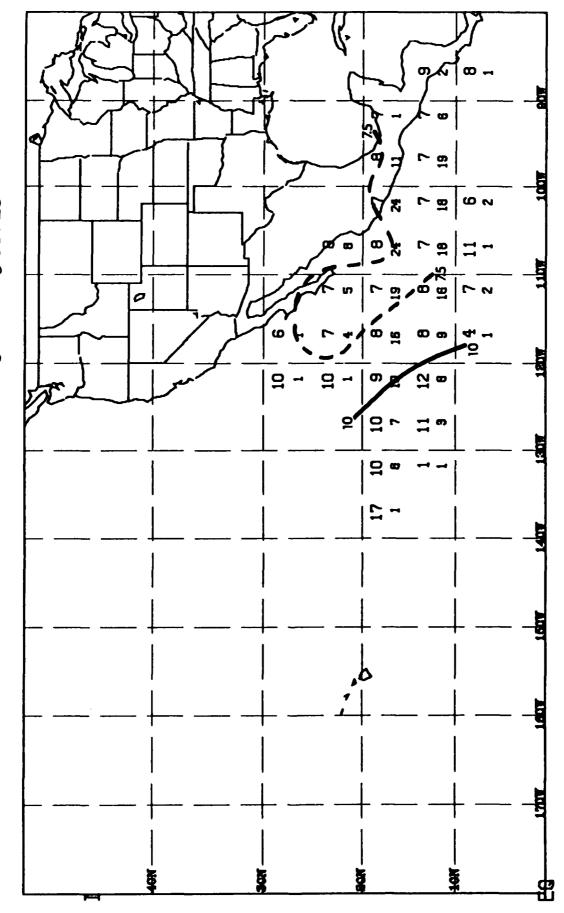
Actual path of all other tropical cyclones (>33 kts).

CONSTANCY AND RELATIVE FREQUENCY FOR JUN 9 - JUN 23



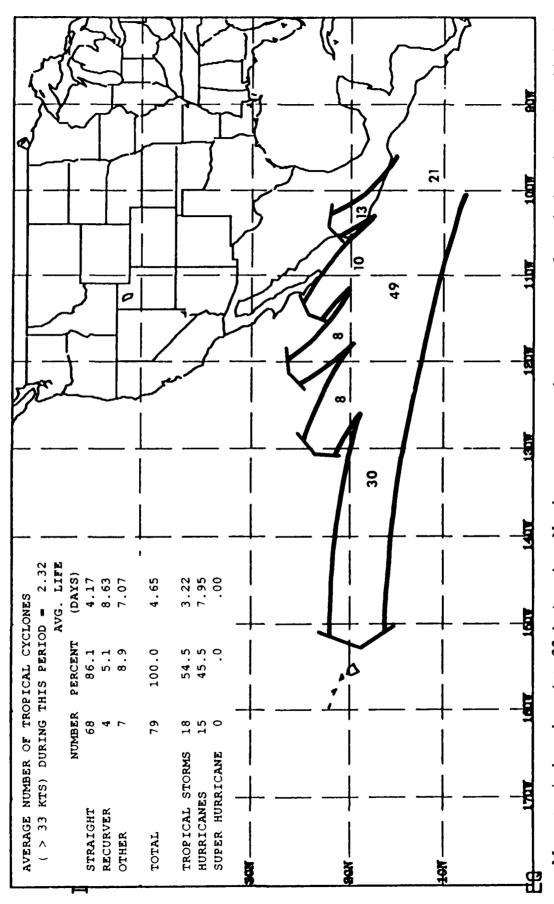
the 12-hr average vector speed divided by the 12-hr average scalar speed. the number of tropical cyclones passing through the 50 latitude by 50 33 kts) Constancy (top number) and Relative Frequency (bottom number). time period. longitude square per year per Frequency is Constancy is defined Relative Frequency cyclone Tropical

SPEED OF MOVEMENT FOR JUN 9 - JUN 23

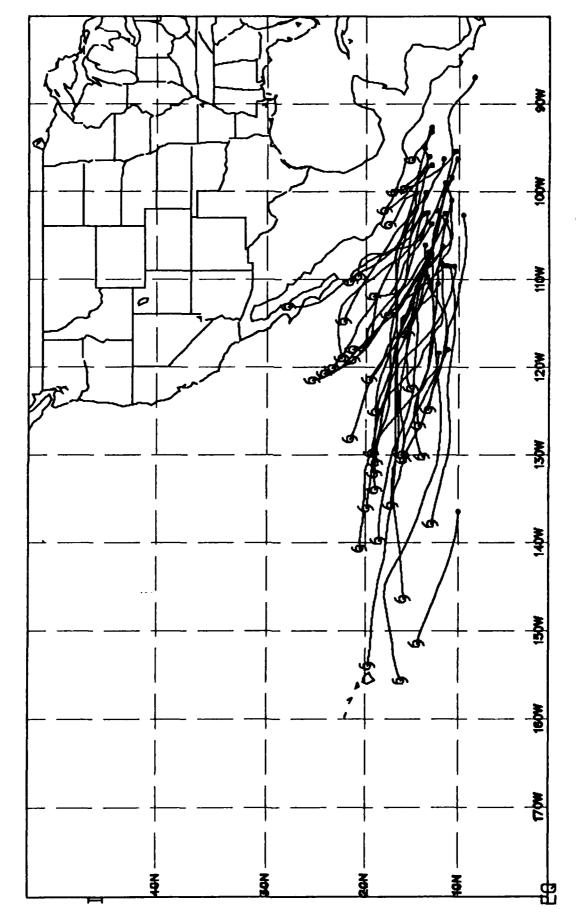


(> 33 kts) Speed (top number) in knots and sample size (bottom number) for longitude square. Contours are drawn only to those squares containing at Average tropical cyclone each 5° latitude by 5° least 5% of the sample.

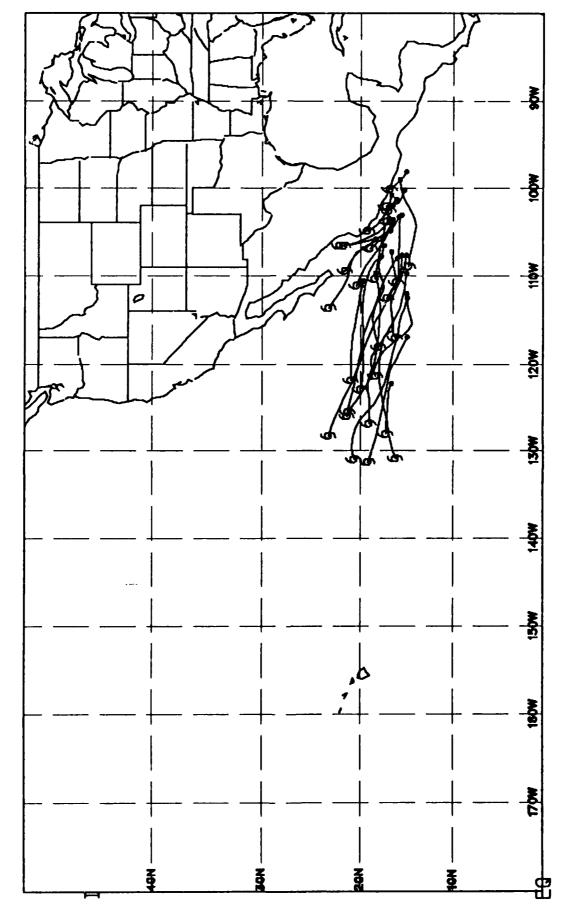
MEAN PATHS FOR JUN 24 - JUL 8



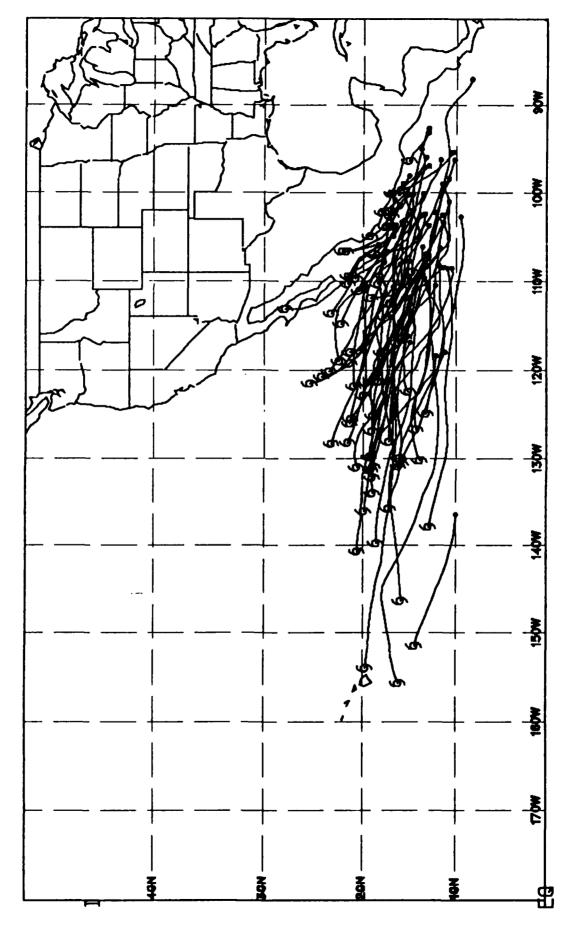
Numbers represent the percentage of tropical cyclones (> 33 kts) numbers may not add up to 100% since not all tropical cyclones develop/dissipate along a path. Tracks which contained less than 5% of the tropical cyclones (> 33 kts) are ignored. (> 33 kts) follow a mean path and some Mean tropical cyclone (> 33 kts) path. which followed the indicated path.



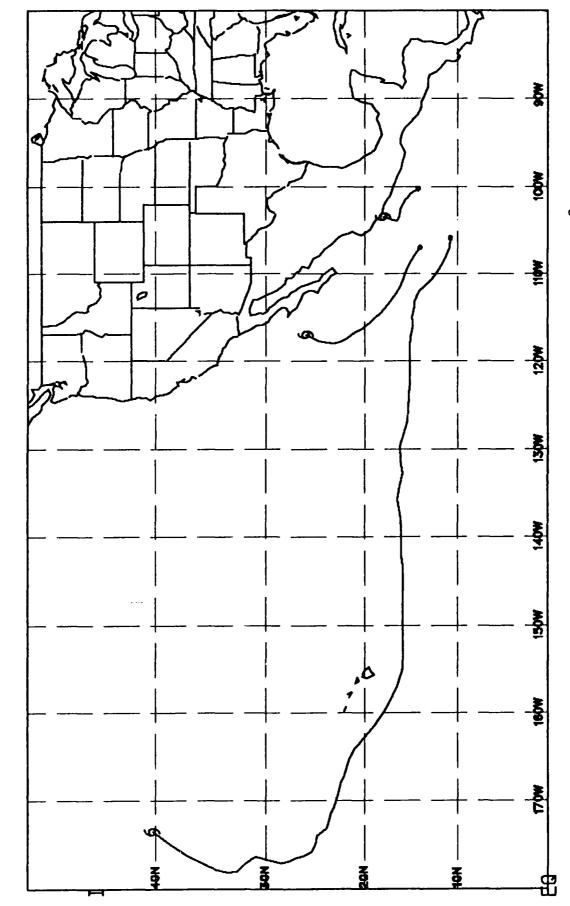
Actual path of straight tropical cyclones (> 33 kts) developing south of 15°N.



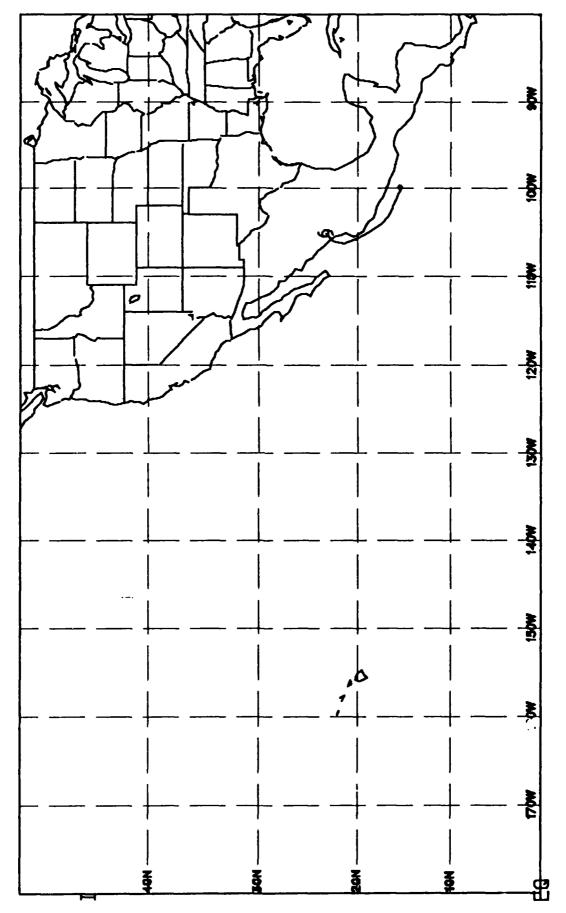
Actual path of straight tropical cyclones (> 33 kts) developing at or north of 150N.



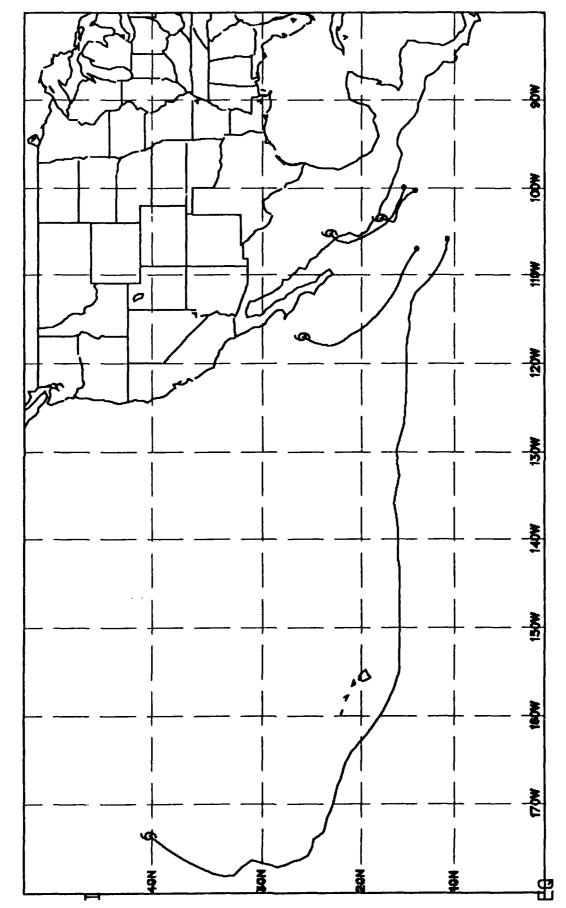
Actual path of all straight tropical cyclones (> 33 kts).



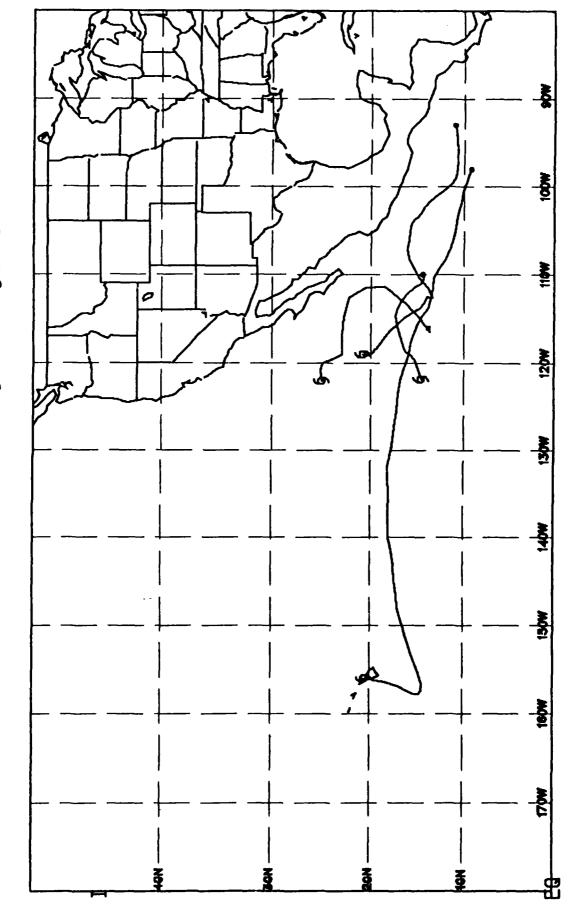
Actual path of recurving tropical cyclones (> 33 kts) developing south of 150N.



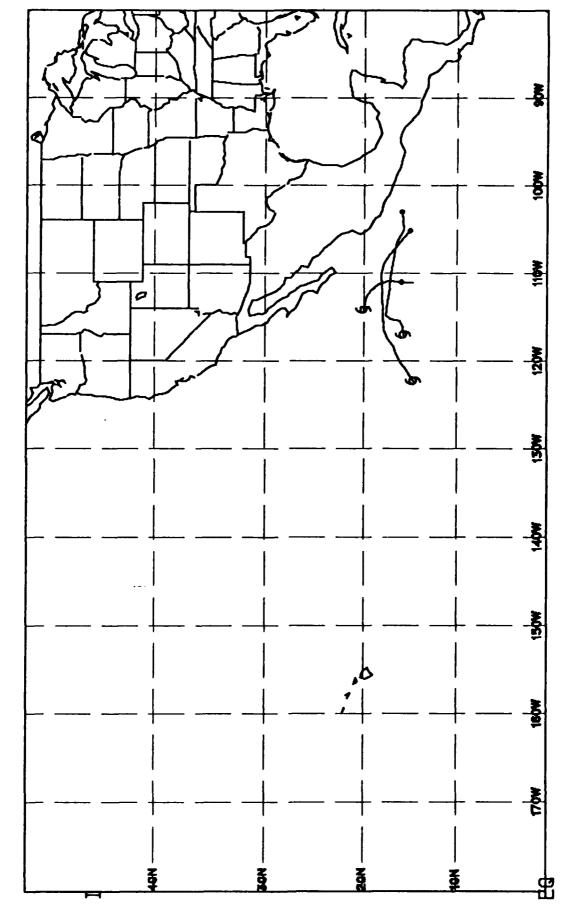
Actual path of recurving tropical cyclones (>33 kts) developing at or north of 159N.



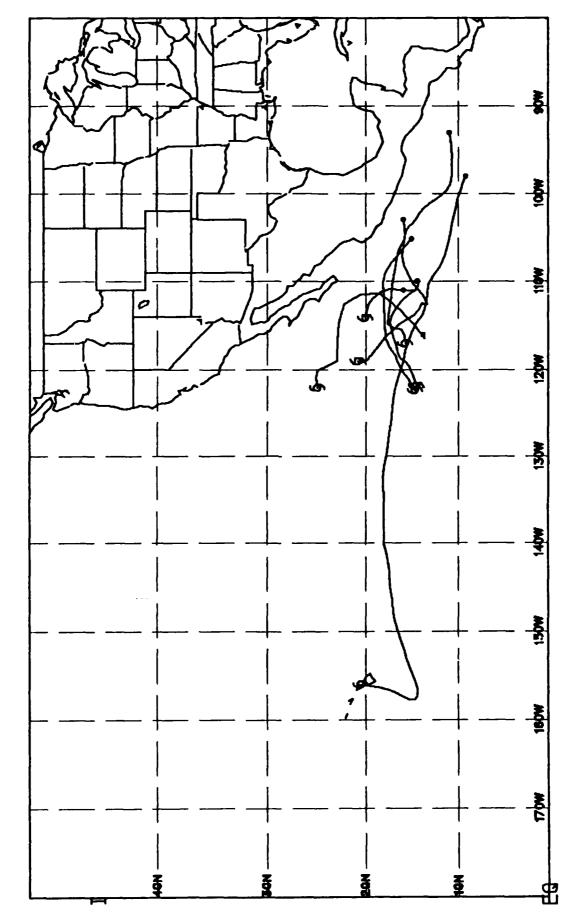
Actual path of all recurving tropical cyclones (>33 kts).



Actual path of other tropical cyclones (>33 kts) developing south of 15°N.

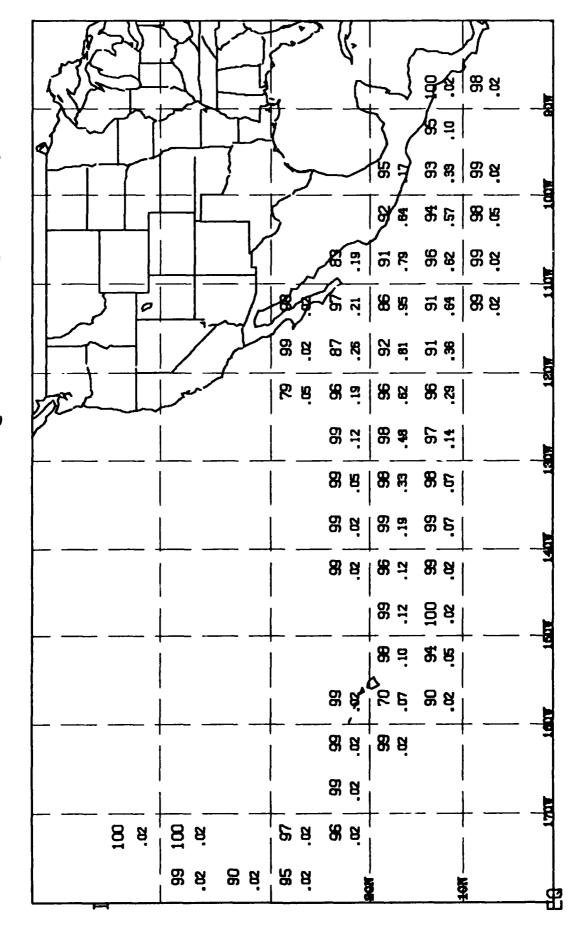


Actual path of other tropical cyclones (> 33 kts) developing at or north of 15°N.



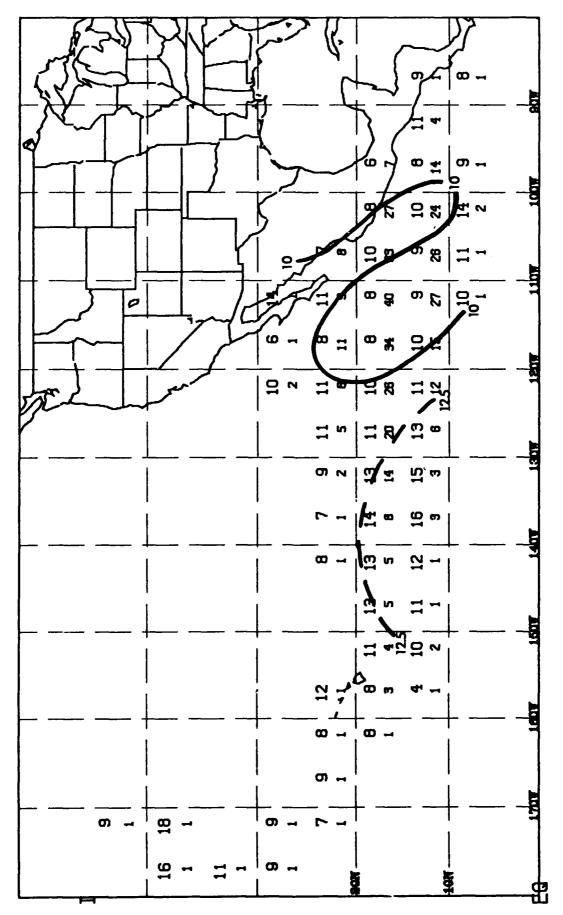
Actual path of all other tropical cyclones (> 33 kts).

CONSTANCY AND RELATIVE FREQUENCY FOR JUN 24 - JUL 8



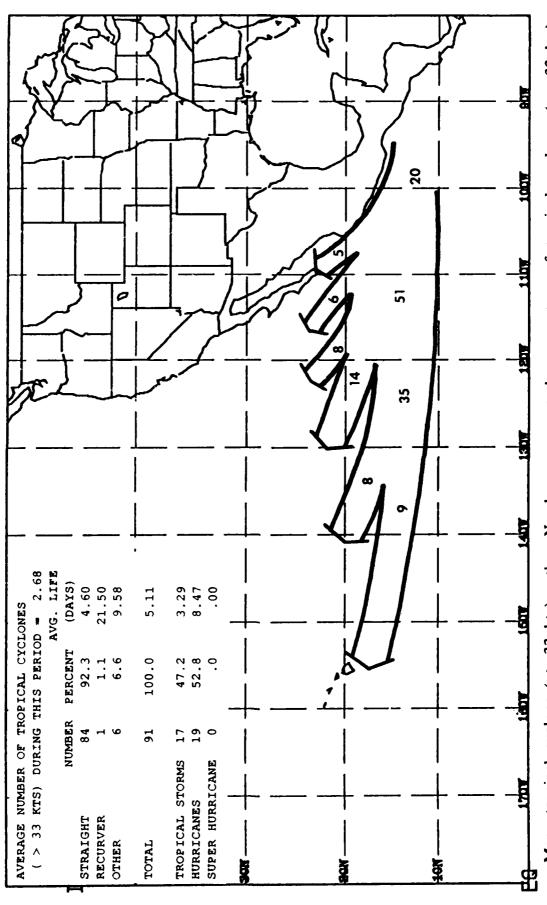
as the 12-hr average vector speed divided by the 12-hr average scalar speed. 33 kts) Constancy (top number) and Relative Frequency (bottom number). cyclones passing through the tropical number of Constancy is defined as the 12-hr ave Relative Frequency is the number of longitude square per year per time period. cyclone Tropical

SPEED OF MOVEMENT FOR JUN 24 - JUL 8

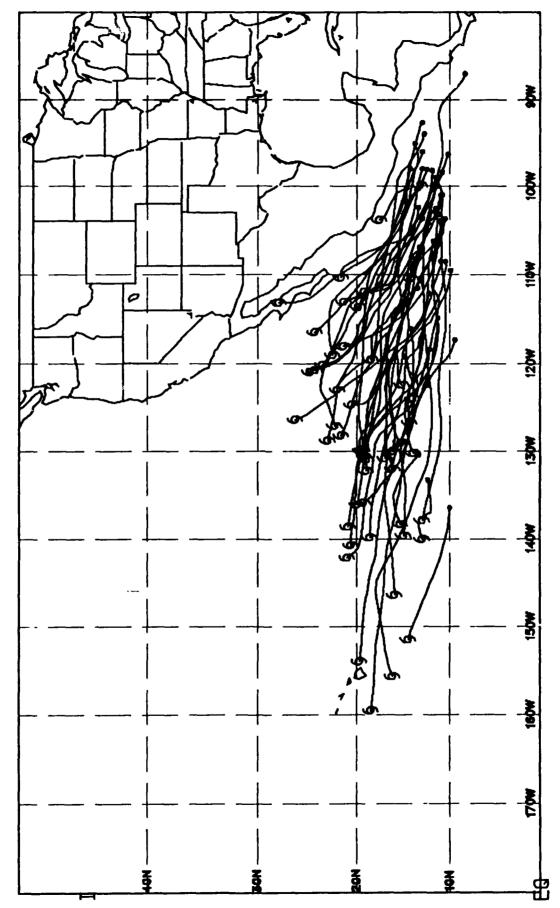


(> 33 kts) Speed (top number) in knots and sample size (bottom number) for longitude squares. Contours are drawn only to those squares containing at Average tropical cyclone each 5° latitude by 5° least 5% of the sample.

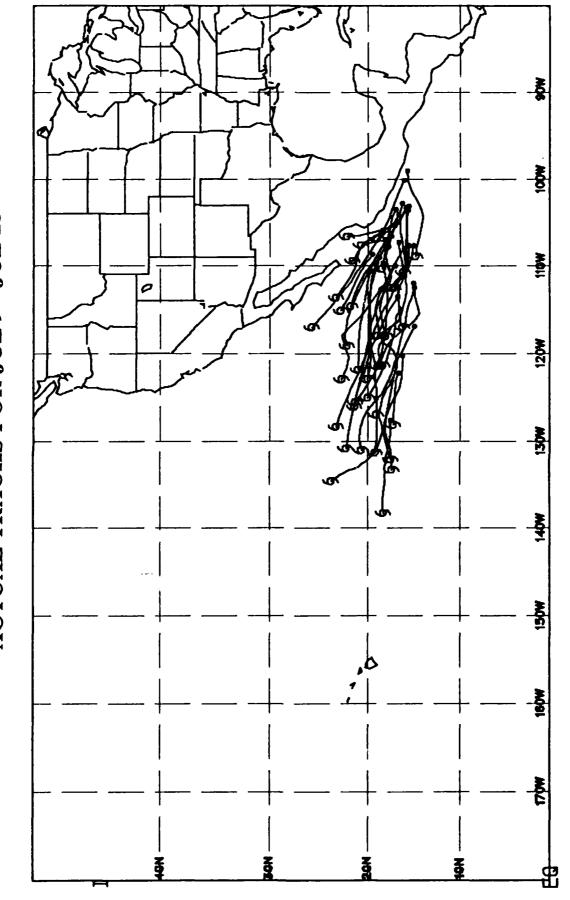
MEAN PATHS FOR JUL 9 - JUL 23



Numbers represent the percentage of tropical cyclones (> 33 kts) numbers may not add up to 100% since not all tropical cyclones develop/dissipate along a path. Tracks which contained less than which followed the indicated path. These numbers in (> 33 kts) follow a mean path and some develop/dis 5% of the tropical cyclones (> 33 kts) are ignored. Mean tropical cyclone (> 33 kts) path.

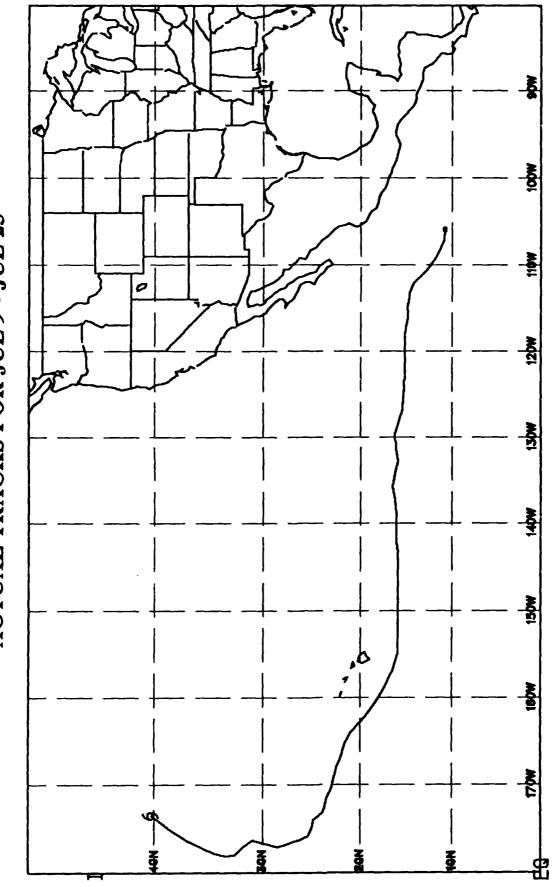


Actual path of straight tropical cyclones (> 33 kts) developing south of 15°N.

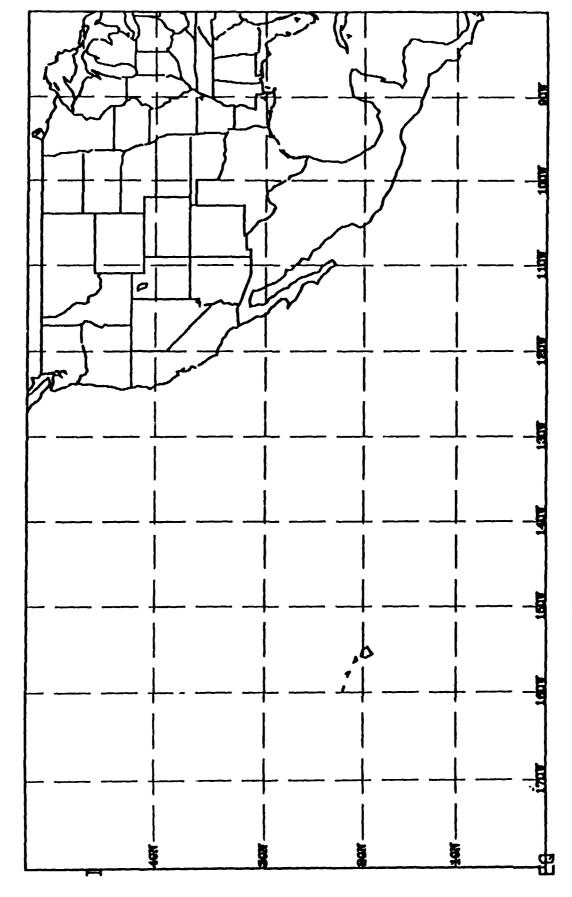


Actual path of straight tropical cyclones (>33 kts) developing at or north of 150N.

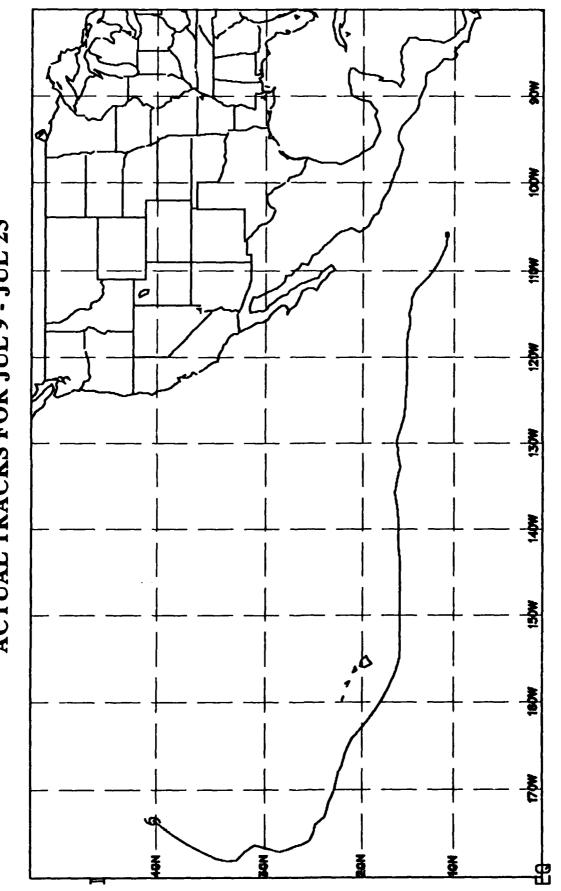
Actual path of all straight tropical cyclones (> 33 kts).



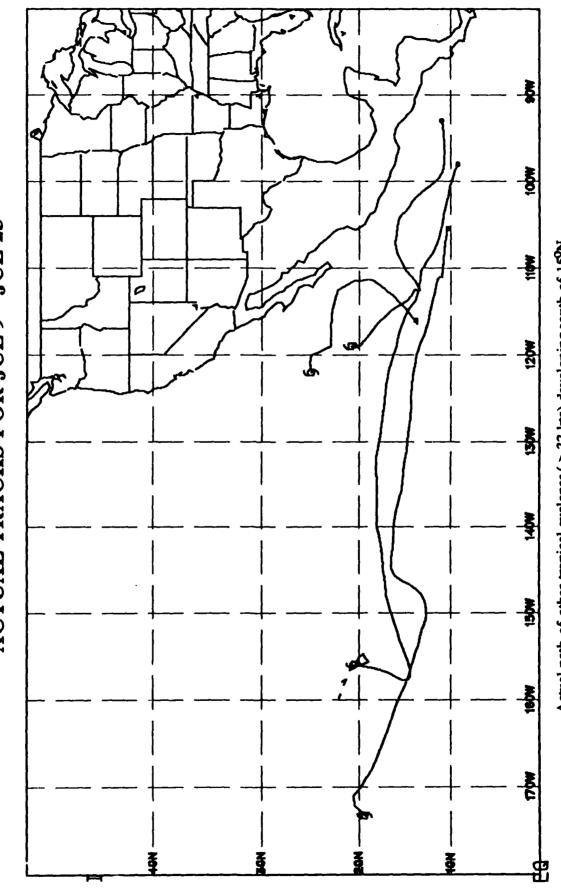
Actual path of recurving tropical cyclones (>33 kts) developing south of 15°N.



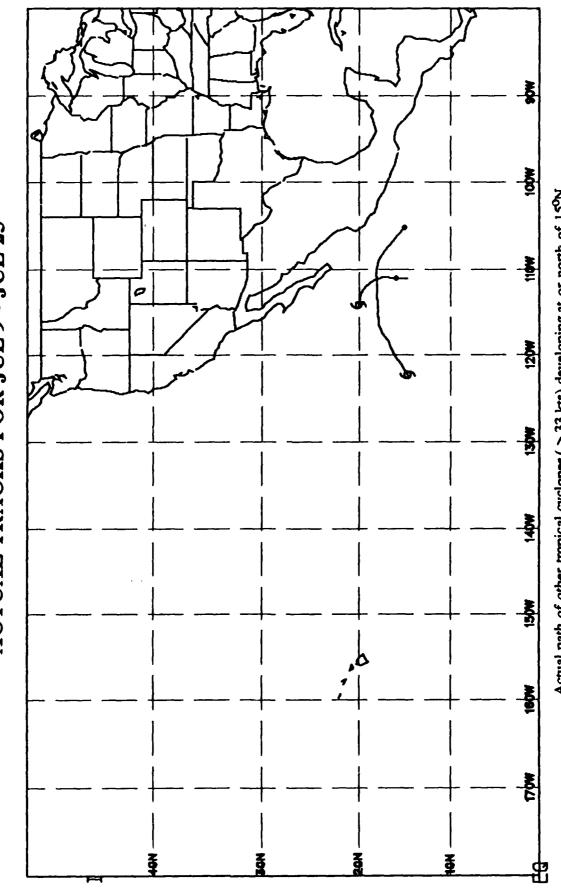
Actual path of recurving tropical cyclones (> 33 kts) developing at or north of 150N.



Actual path of all recurving tropical cyclones (>33 kts).



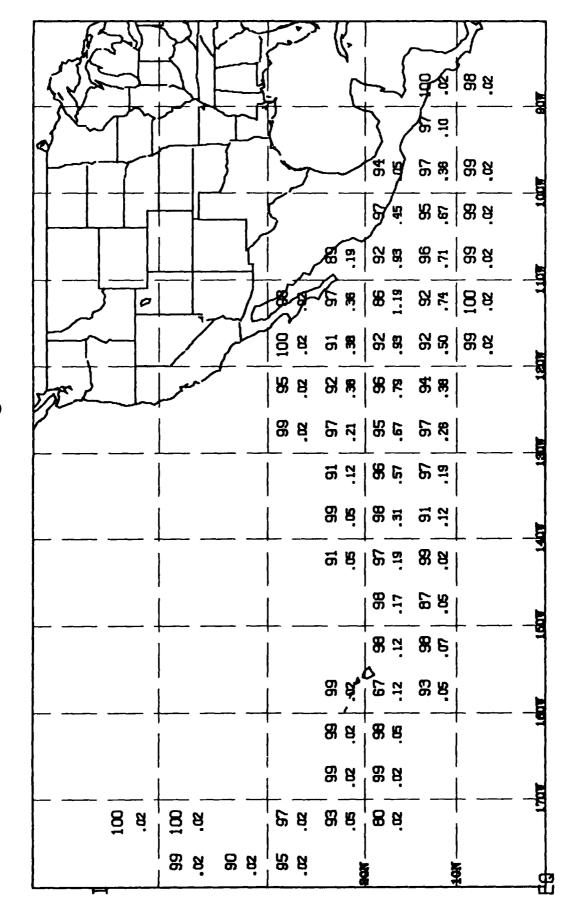
Actual path of other tropical cyclones (>33 kts) developing south of 150N.



Actual path of other tropical cyclones (> 33 kts) developing at or north of 15°N.

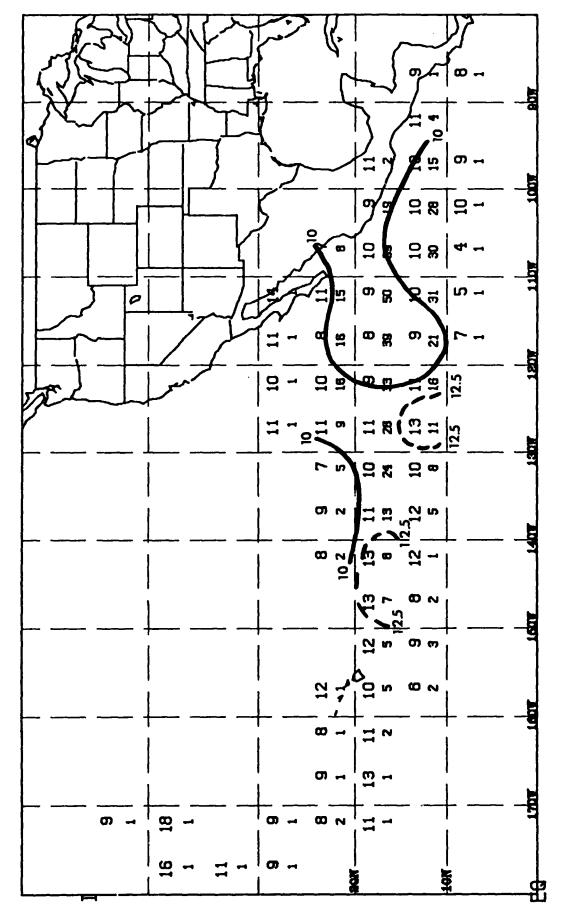
Actual path of all other tropical cyclones (>33 kts).

CONSTANCY AND RELATIVE FREQUENCY FOR JUL 9 - JUL 23



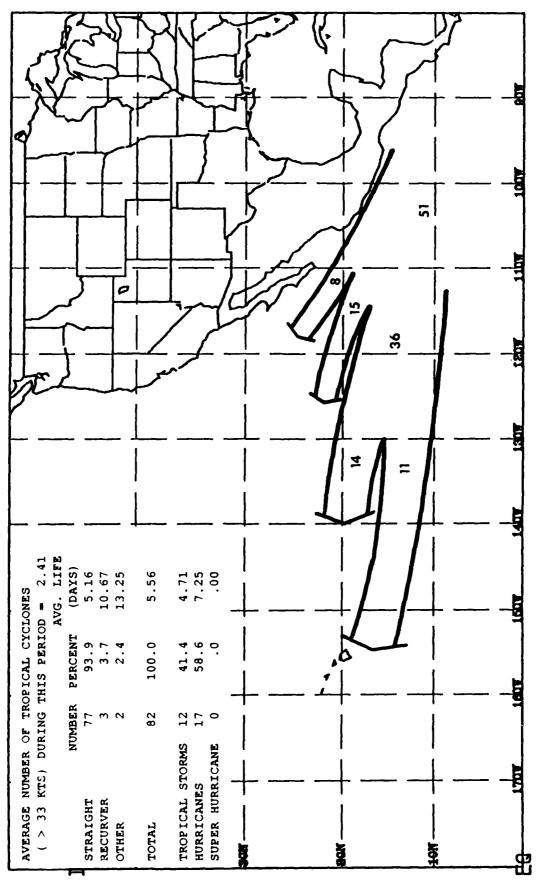
> 33 kts) Constancy (top number) and Relative Frequency (bottom number). as the 12-hr average scalar speed. is the number of tropical cyclones passing through the 50 latitude by 50 cyclones passing through tropical longitude square per year per time period. 13 Constancy is defined Frequency Tropical cyclone (Relative

SPEED OF MOVEMENT FOR JUL 9 - JUL 23

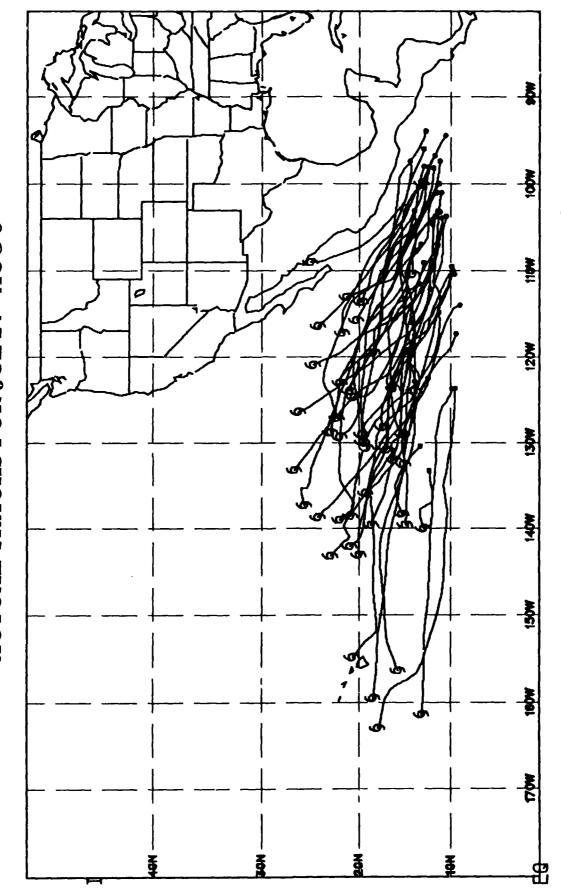


Average tropical cyclone (> 33 kts) Speed (top number) in knots and sample size (bottom number) for each 5° latitude by 5° longitude square. Contours are drawn only to those squares containing at least 5% of the sample.

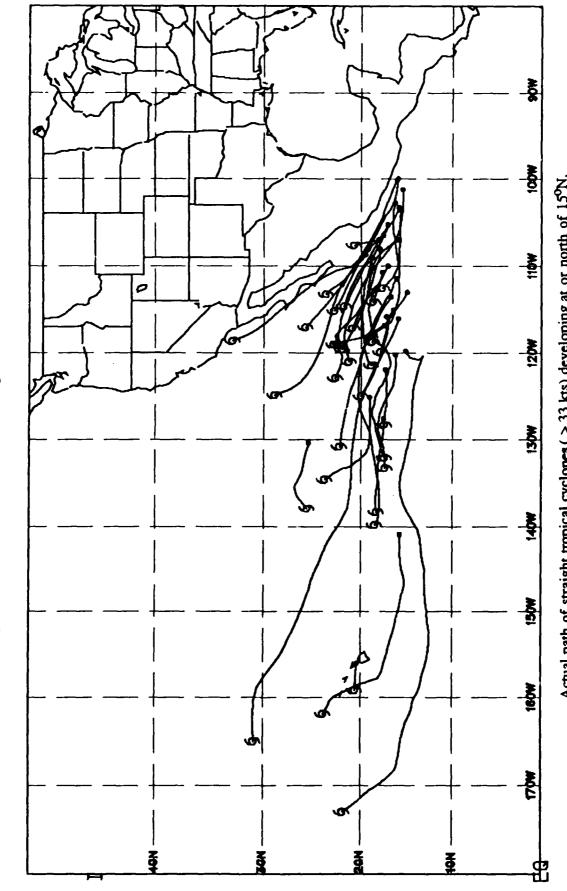
MEAN PATHS FOR JUL 24 - AUG 8



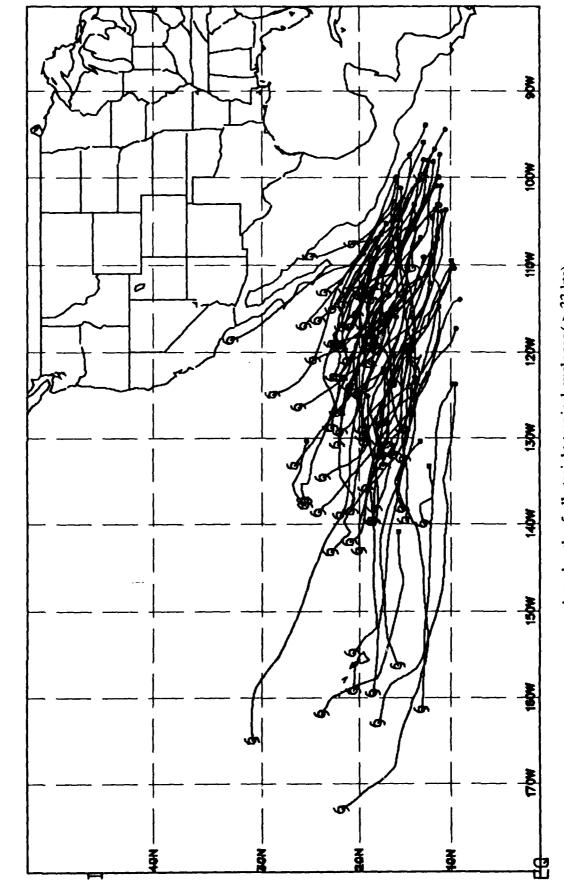
Numbers represent the percentage of tropical cyclones (> 33 kts) numbers may not add up to 100% since not all tropical cyclones develop/dissipate along a path. Tracks which contained less than Mean tropical cyclone (> 33 kts) path. Numbers rep which followed the indicated path. These numbers m (> 33 kts) follow a mean path and some develop/dis 5% of the tropical cyclones (> 33 kts) are ignored.



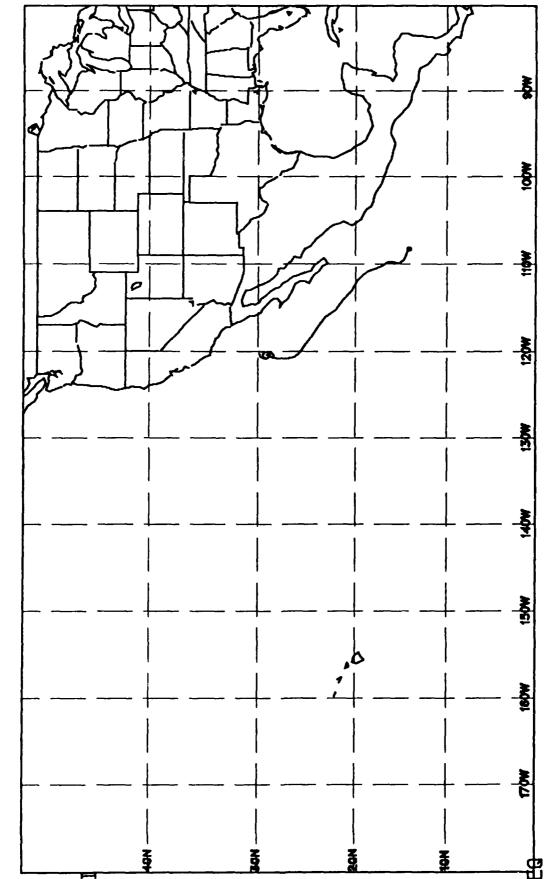
Actual path of straight tropical cyclones (> 33 kts) developing south of 15°N.



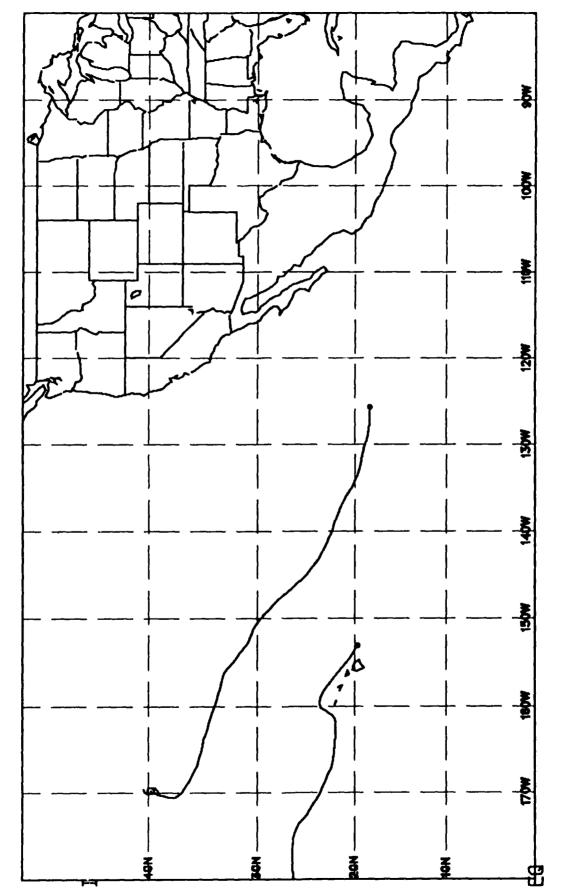
Actual path of straight tropical cyclones (> 33 kts) developing at or north of 15°N.



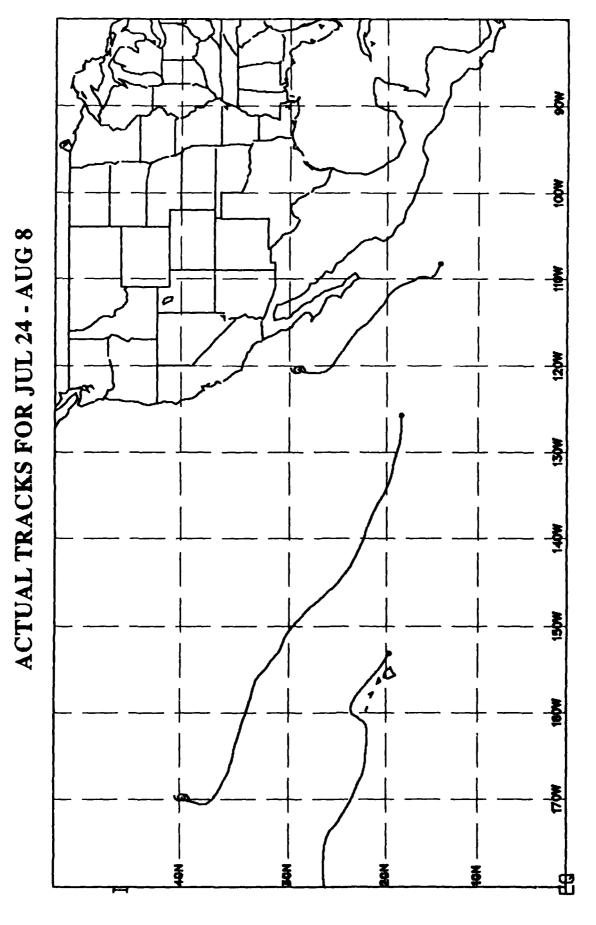
Actual path of all straight tropical cyclones (>33 kts).



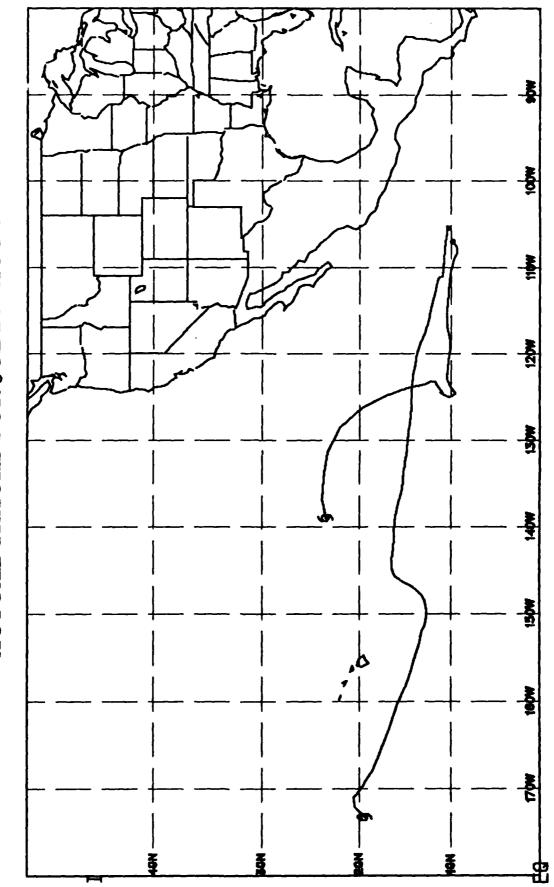
Actual path of recurving tropical cyclones (> 33 kts) developing south of 15°N.



Actual path of recurving tropical cyclones (>33 kts) developing at or north of 15°N.



Actual path of all recurving tropical cyclones (> 33 kts).



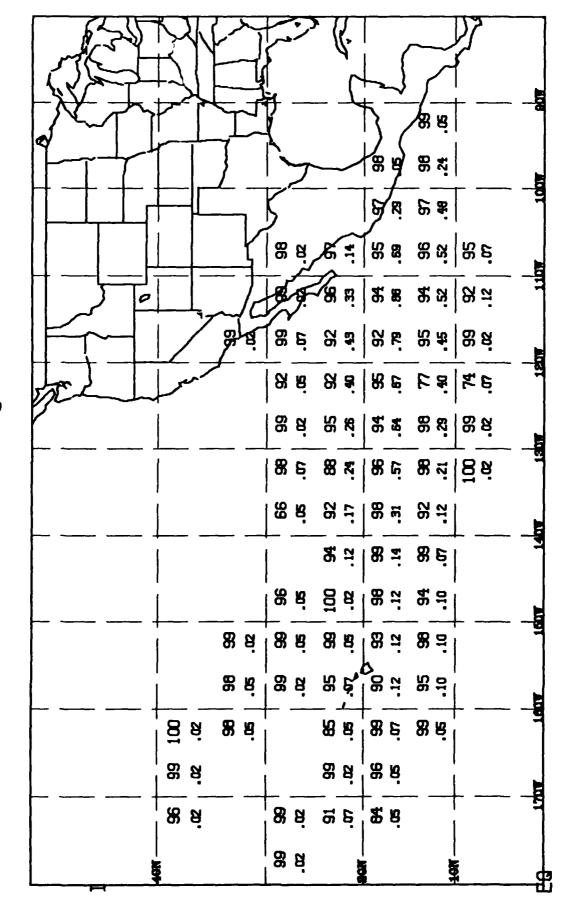
Actual path of other tropical cyclones (> 33 kts) developing south of 150N.

Actual path of other tropical cyclones (> 33 kts) developing at or north of 15°N.

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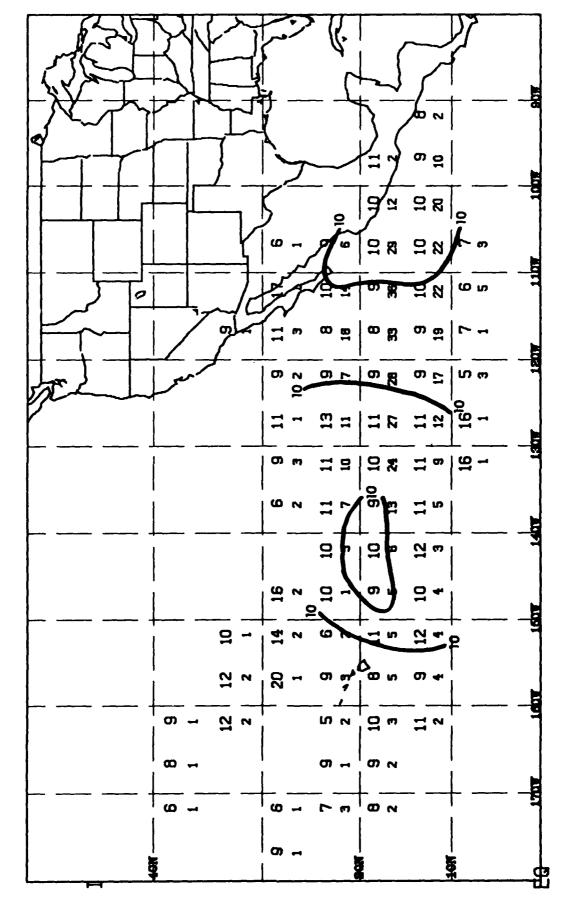
Actual path of all other tropical cyclones (>33 kts).

CONSTANCY AND RELATIVE FREQUENCY FOR JUL 24 - AUG 8



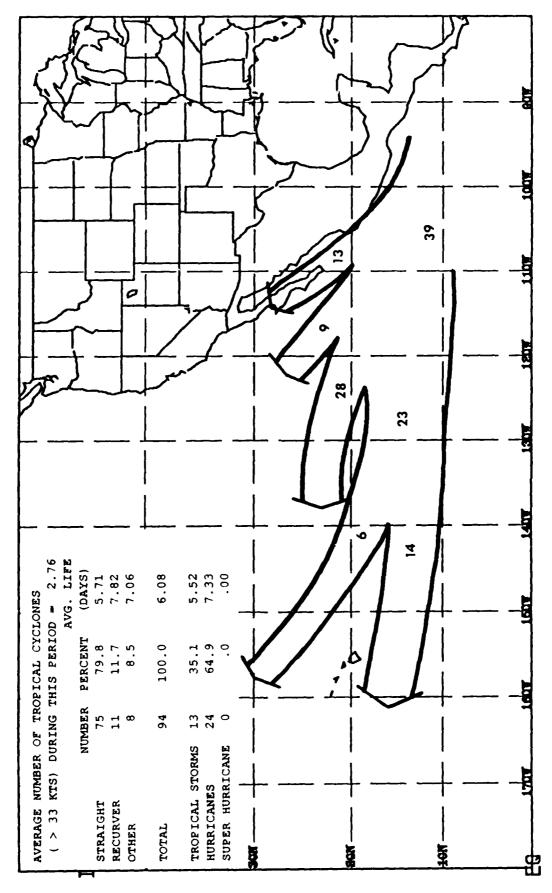
> 33 kts) Constancy (top number) and Relative Frequency (bottom number). as the 12-hr average scalar speed. Is the number of tropical cyclones passing through the 50 latitude by 50 longitude square per year per time period. Relative Frequency is Constancy is defined Tropical cyclone (

SPEED OF MOVEMENT FOR JUL 24 - AUG 8

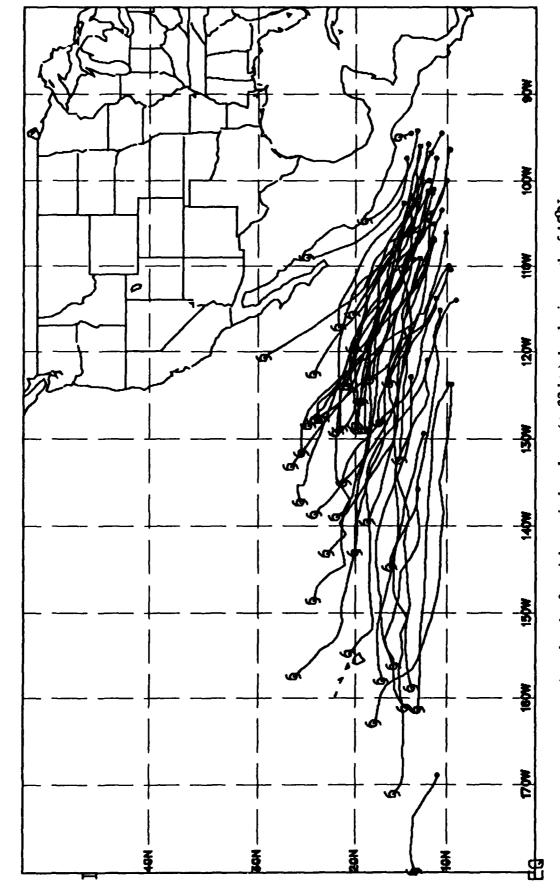


Average tropical cyclone (> 33 kts) Speed (top number) in knots and sample size (bottom number) for each 5° latitude by 5° longitude square. Contours are drawn only to those squares containing at least 5% of the sample.

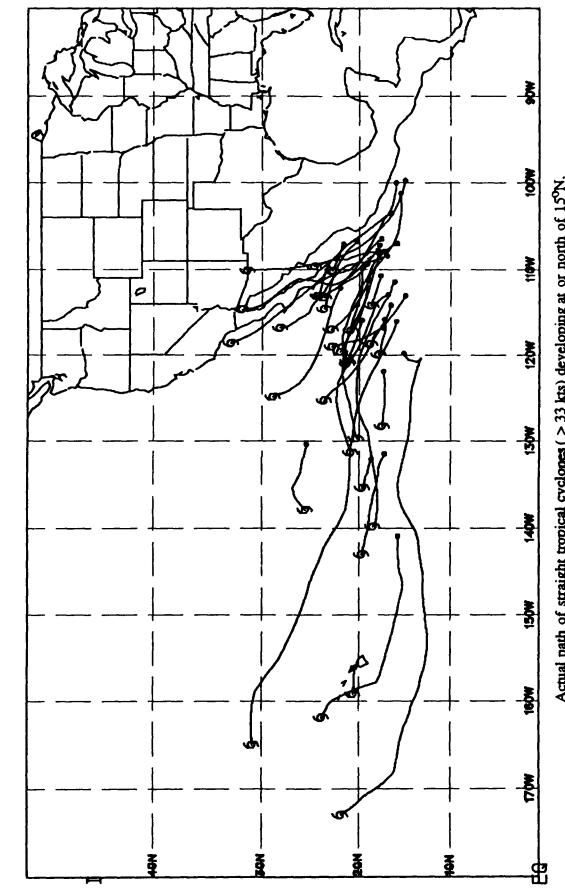
MEAN PATHS FOR AUG 9 - AUG 23



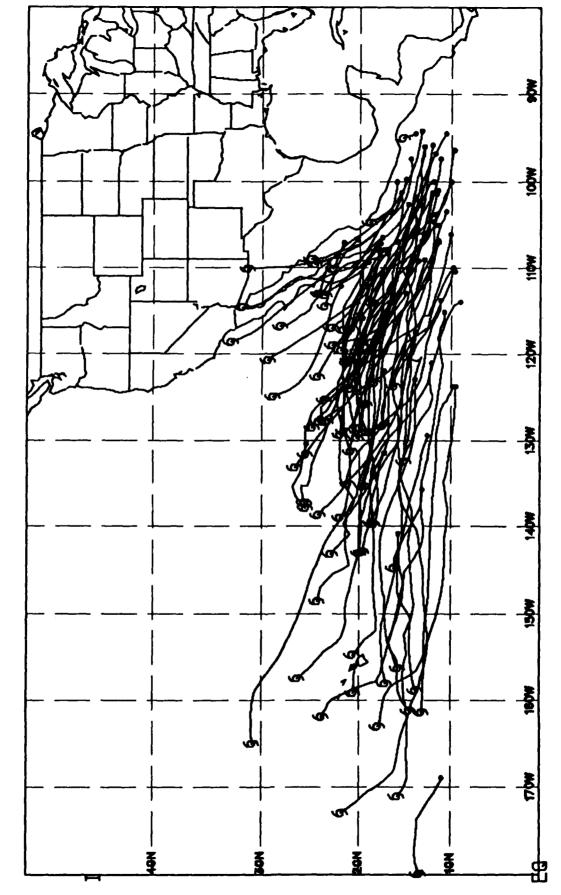
Numbers represent the percentage of tropical cyclones (> 33 kts) numbers may not add up to 100% since not all tropical cyclones develop/dissipate along a path. Tracks which contained less than develop/dissipate along a path. which followed the indicated path. These numbers m (> 33 kts) follow a mean path and some develop/dis 5% of the tropical cyclones (> 33 kts) are ignored. Mean tropical cyclone (> 33 kts) path.



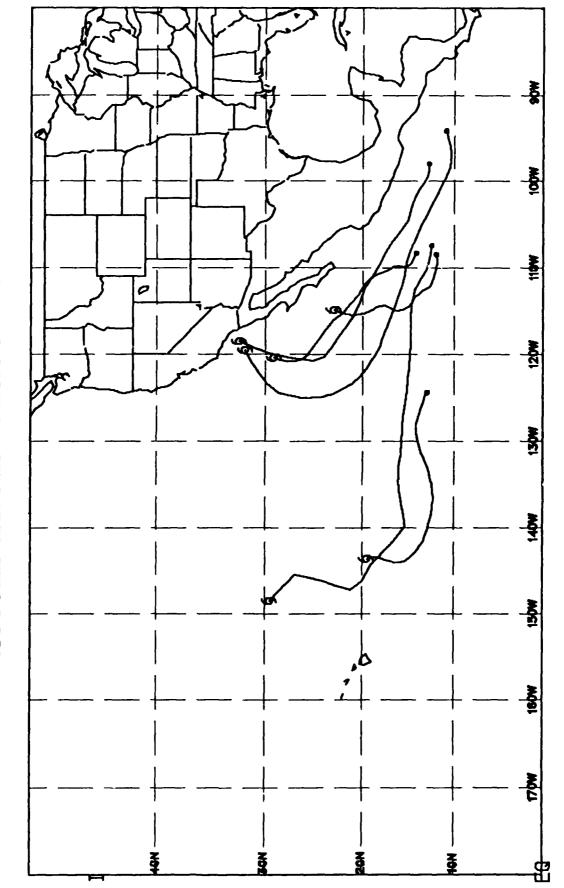
Actual path of straight tropical cyclones (> 33 kts) developing south of 150N.



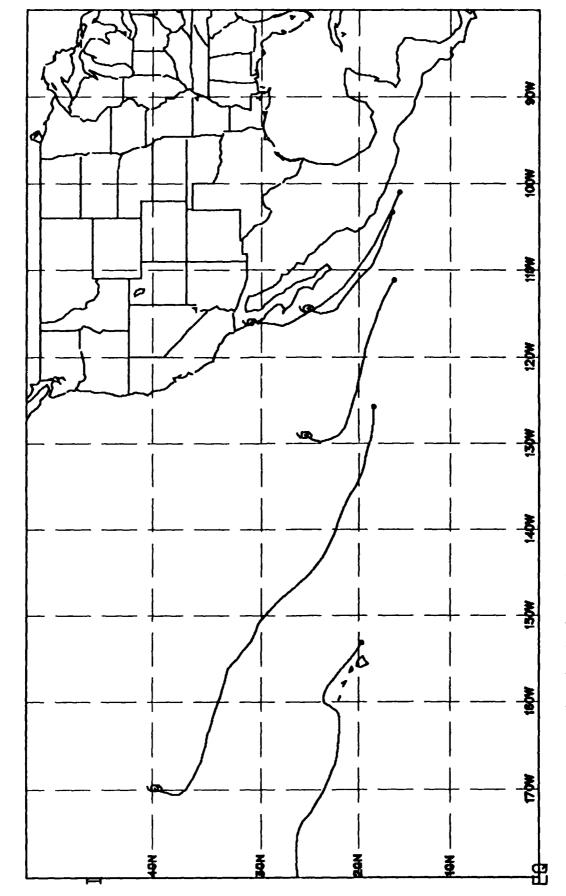
Actual path of straight tropical cyclones (>33 kts) developing at or north of 15°N.



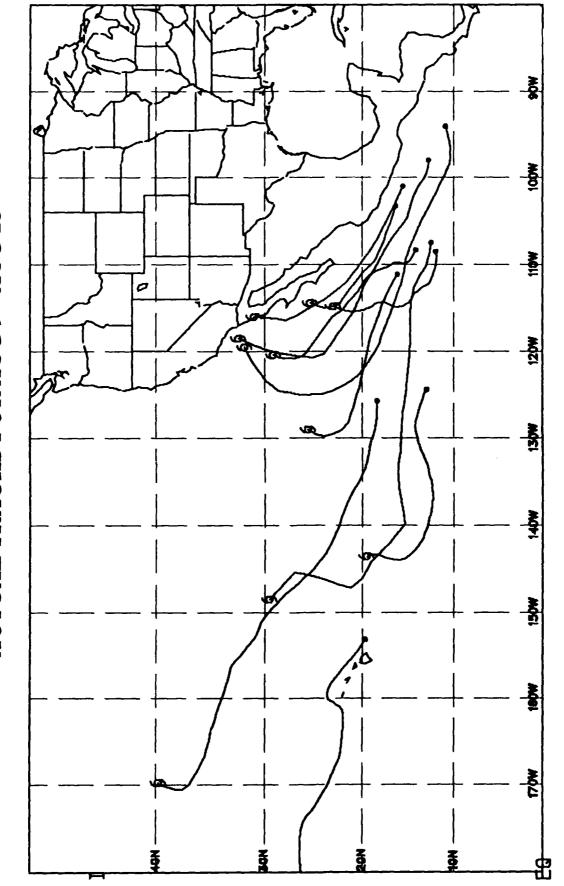
Actual path of all straight tropical cyclones (> 33 kts).



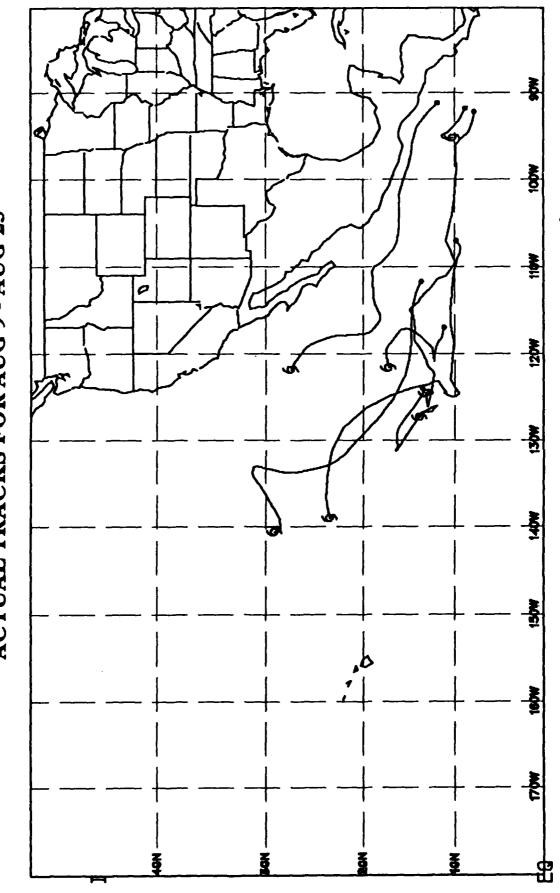
Actual path of recurving tropical cyclones (>33 kts) developing south of 15°N.



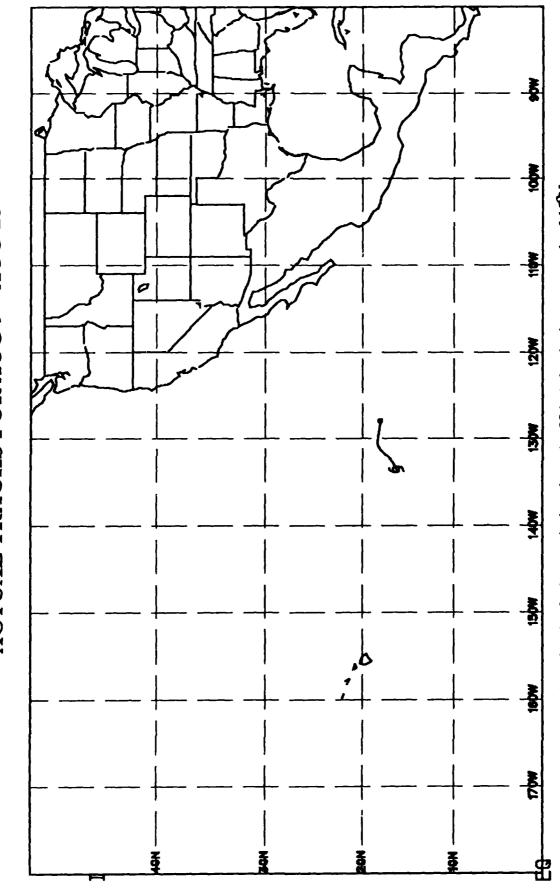
Actual path of recurving tropical cyclones (>33 kts) developing at or north of 15°N.



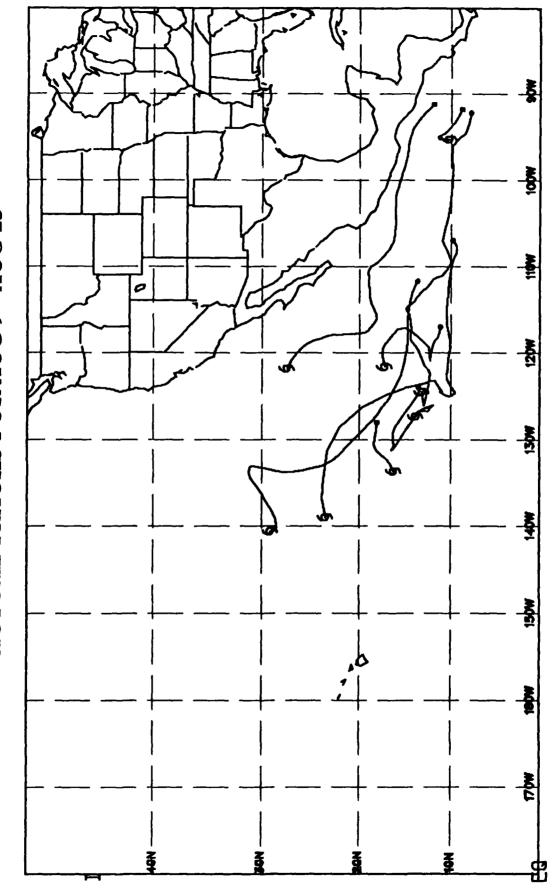
Actual path of all recurving tropical cyclones (>33 kts).



Actual path of other tropical cyclones (> 33 kts) developing south of 15°N.

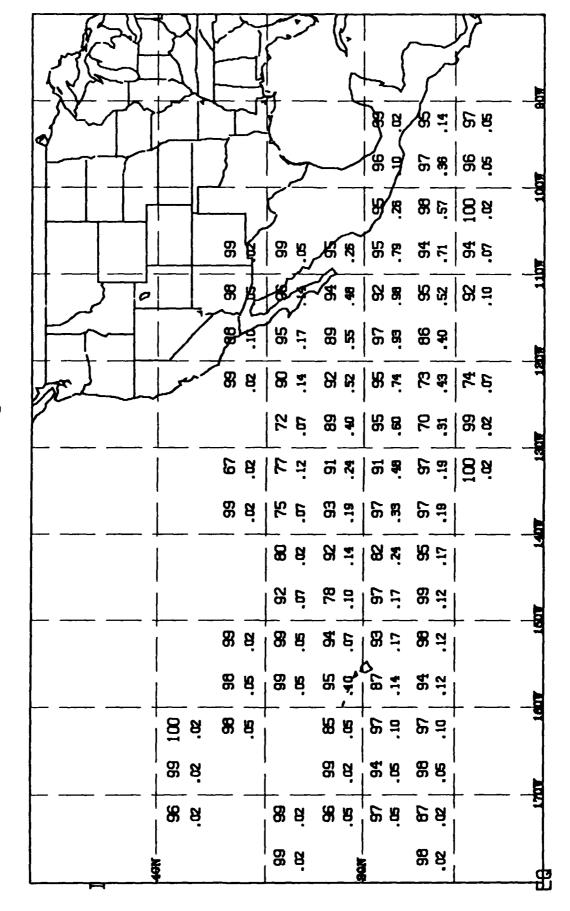


Actual path of other tropical cyclones (>33 kts) developing at or north of 15°N.



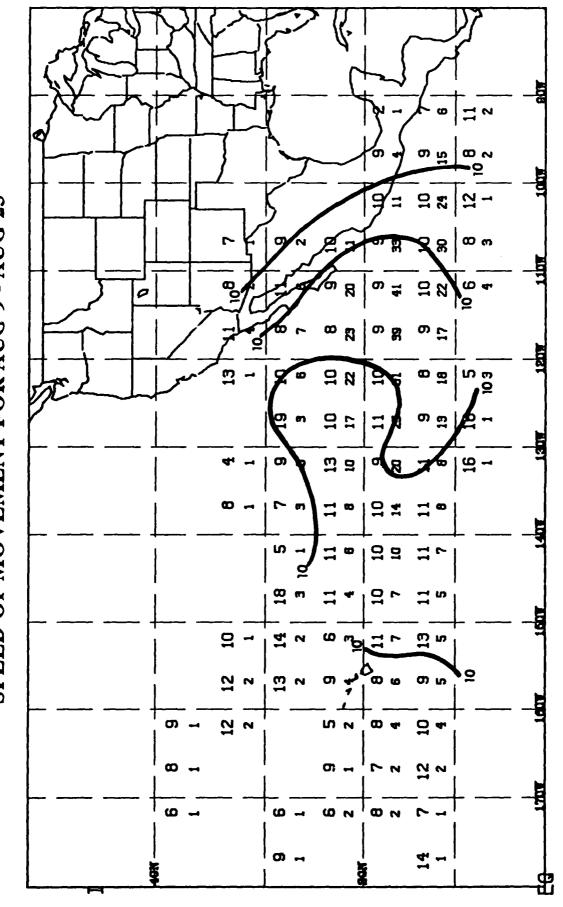
Actual path of all other tropical cyclones (>33 kts).

CONSTANCY AND RELATIVE FREQUENCY FOR AUG 9 - AUG 23



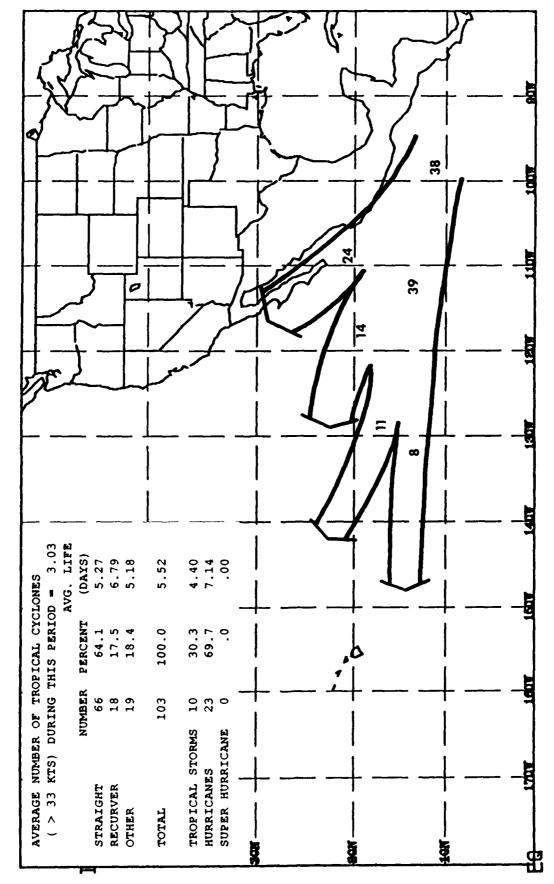
as the 12-hr average vector speed divided by the 12-hr average scalar speed. > 33 kts) Constancy (top number) and Relative Frequency (bottom number). longitude square per year per time period. Constancy is defined as the Relative Frequency is the cyclone (Tropical

SPEED OF MOVEMENT FOR AUG 9 - AUG 23

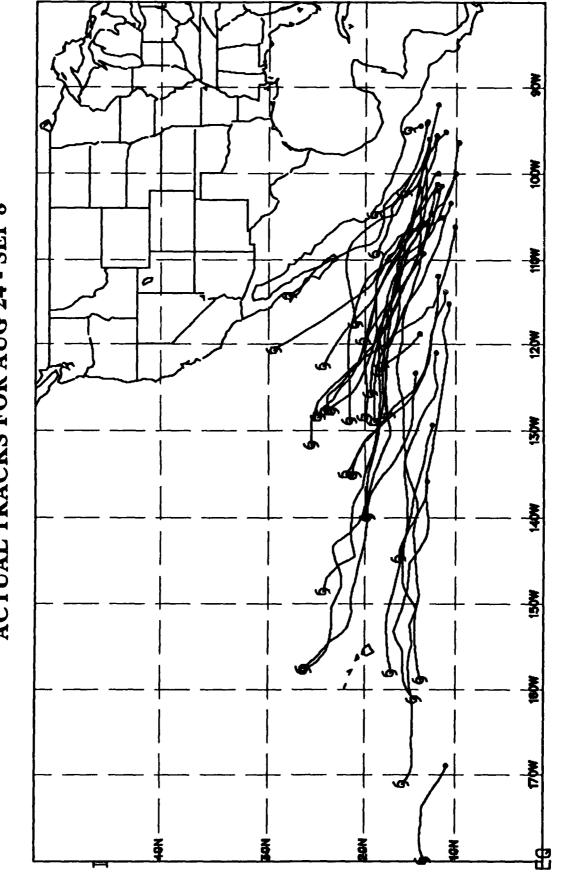


Average tropical cyclone (> 33 kts) Speed (top number) in knots and sample size (bottom number) for each 5° latitude by 5° longitude square. Contours are drawn only to those squares containing at least 5% of the sample.

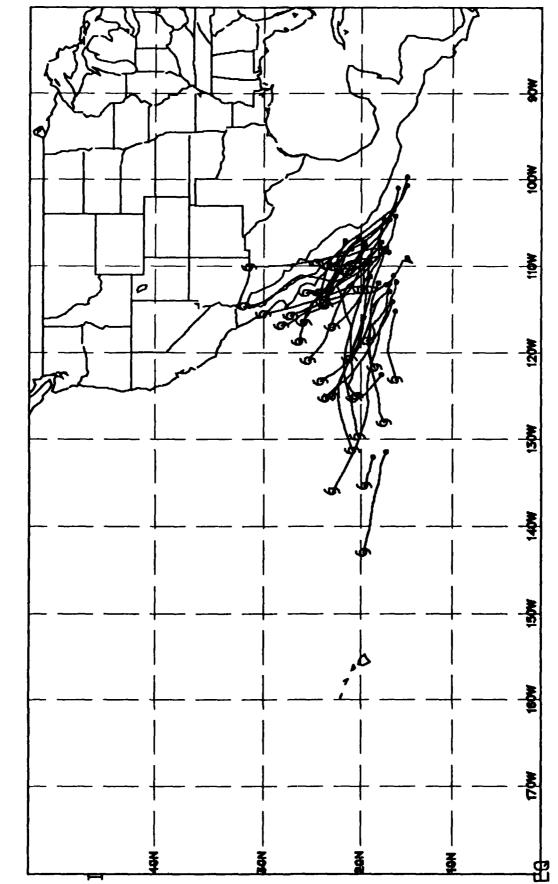
MEAN PATHS FOR AUG 24 - SEP 8



Numbers represent the percentage of tropical cyclones (> 33 kts) numbers may not add up to 100% since not all tropical cyclones develop/dissipate along a path. Tracks which contained less than 5% of the tropical cyclones (> 33 kts) are ignored. These (> 33 kts) follow a mean path and some Mean tropical cyclone (> 33 kts) path. which followed the indicated path.

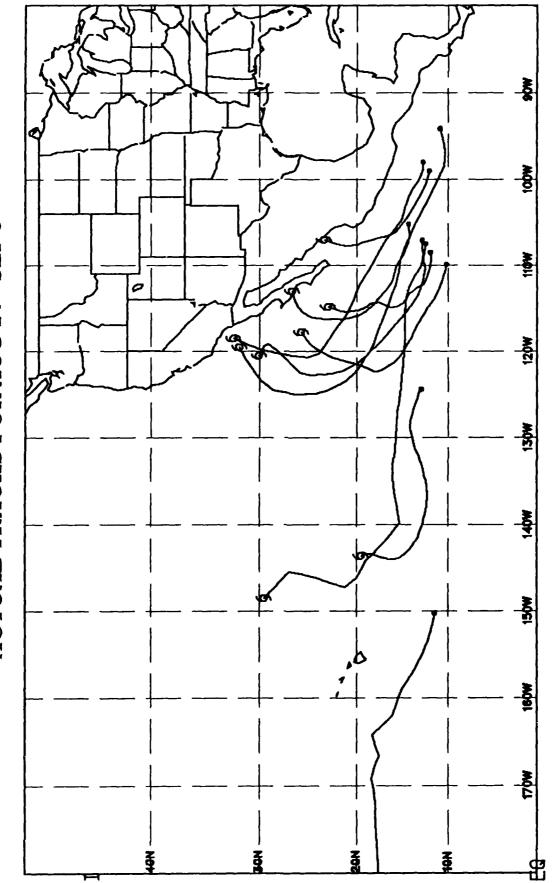


Actual path of straight tropical cyclones (> 33 kts) developing south of 15°N.



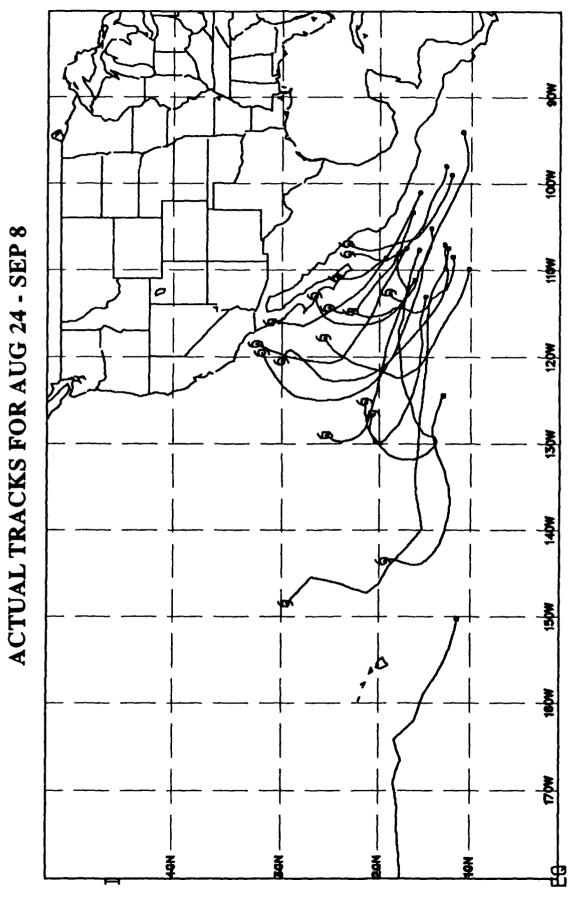
Actual path of straight tropical cyclones (> 33 kts) developing at or north of 15°N.

Actual path of all straight tropical cyclones (> 33 kts).



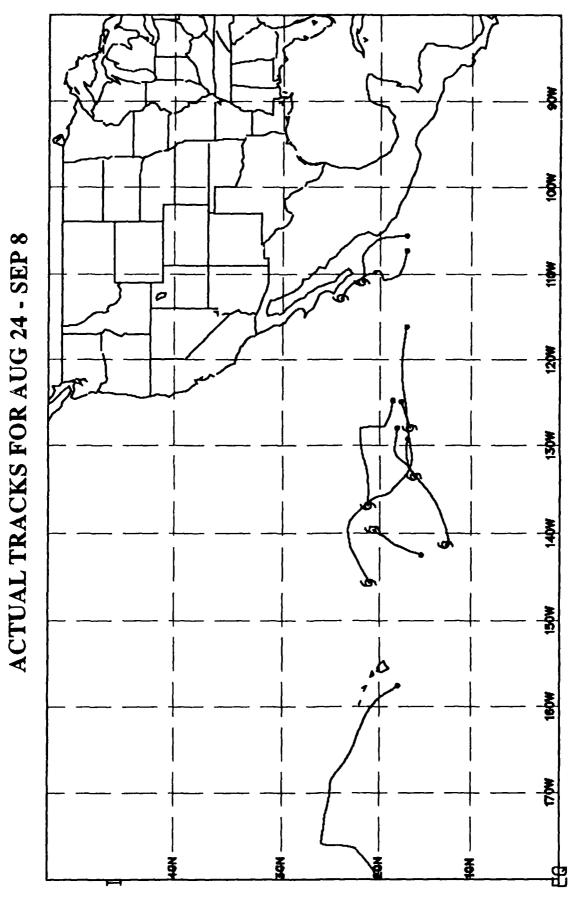
Actual path of recurving tropical cyclones (> 33 kts) developing south of 15°N.

Actual path of recurving tropical cyclones (>33 kts) developing at or north of 15°N.

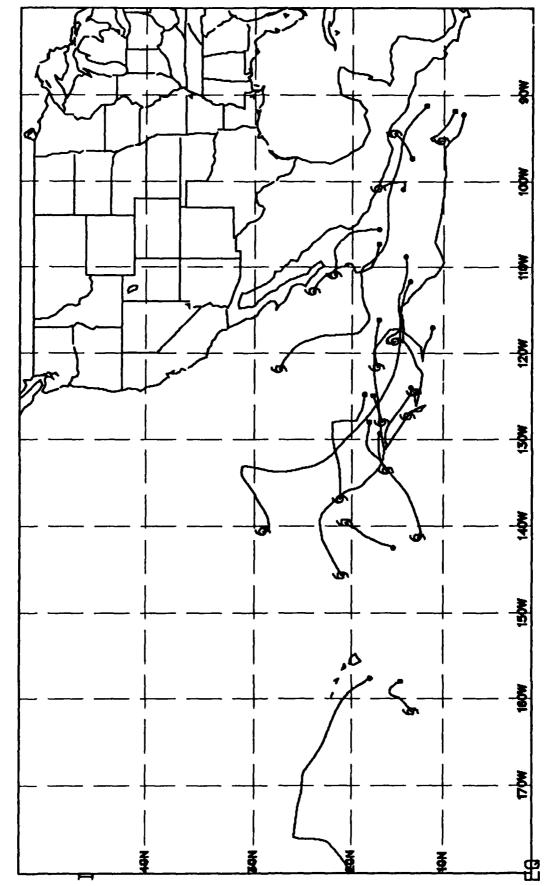


Actual path of all recurving tropical cyclones (> 33 kts).

Actual path of other tropical cyclones (>33 kts) developing south of 150N.

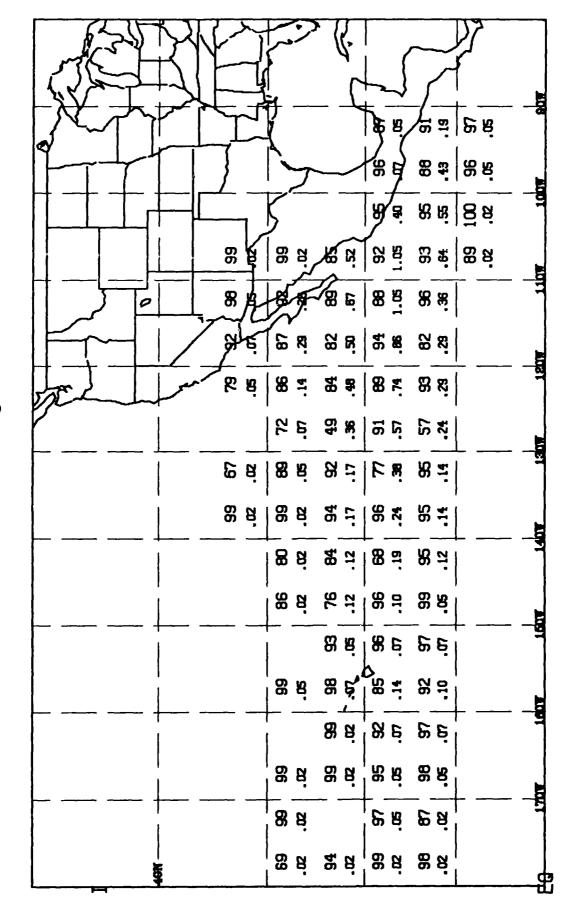


Actual path of other tropical cyclones (> 33 kts) developing at or north of 15°N.



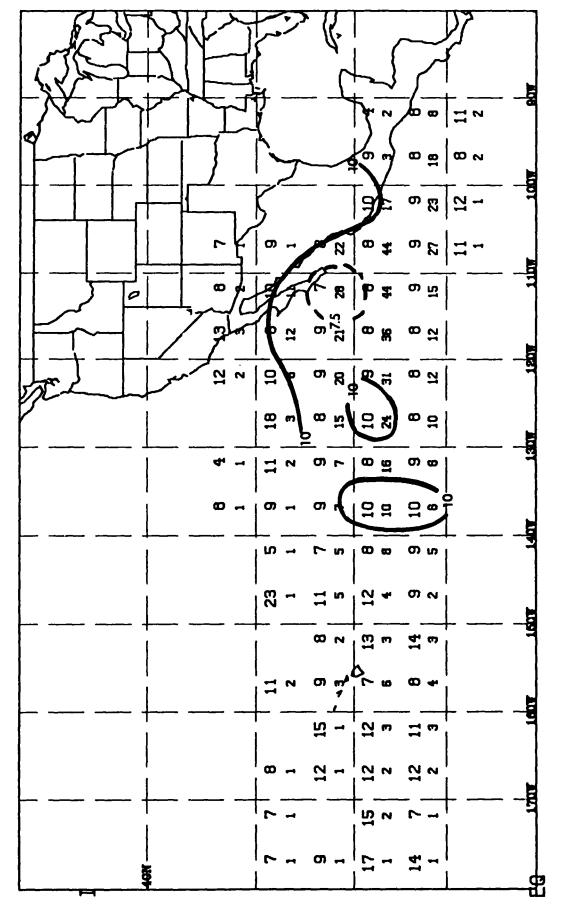
Actual path of all other tropical cyclones (> 33 kts).

CONSTANCY AND RELATIVE FREQUENCY FOR AUG 24 - SEP 8



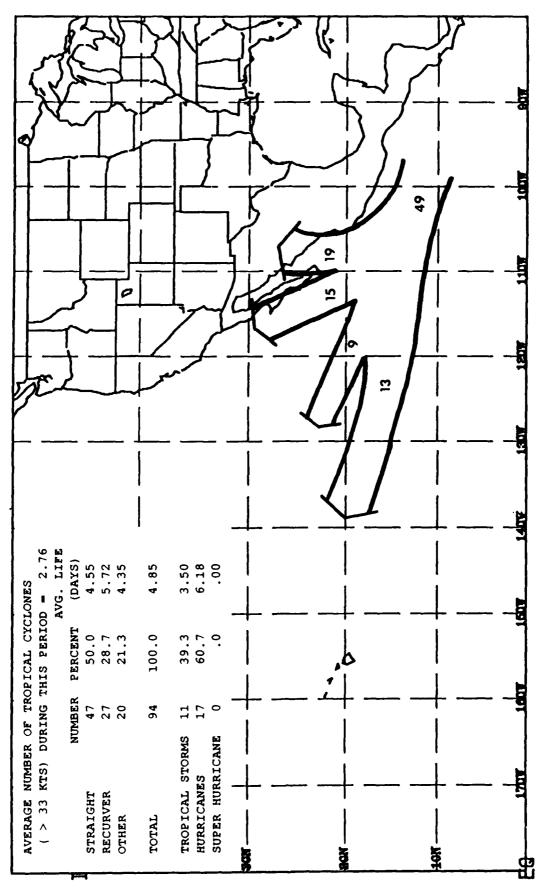
as the 12-hr average vector speed divided by the 12-hr average scalar speed. Frequency (bottom number). cyclones passing through the and Relative kts) Constancy (top number) longitude square per year per time period. Constancy is defined Frequency Tropical cyclone (Relative

SPEED OF MOVEMENT FOR AUG 24 - SEP 8



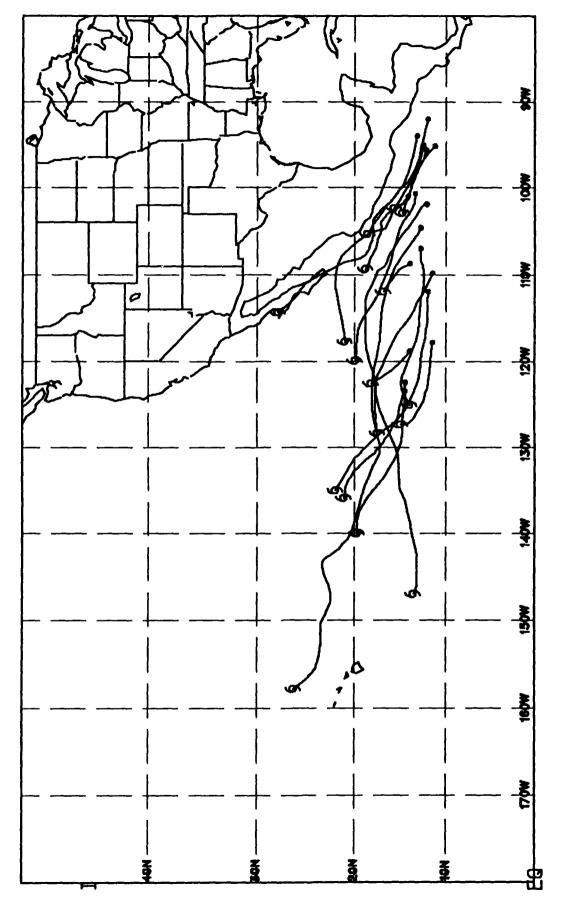
Average tropical cyclone (> 33 kts) Speed (top number) in knots and sample size (bottom number) for each 5° latitude by 5° longitude square. Contours are drawn only to those squares containing at least 5% of the sample.

MEAN PATHS FOR SEP 9 - SEP 23



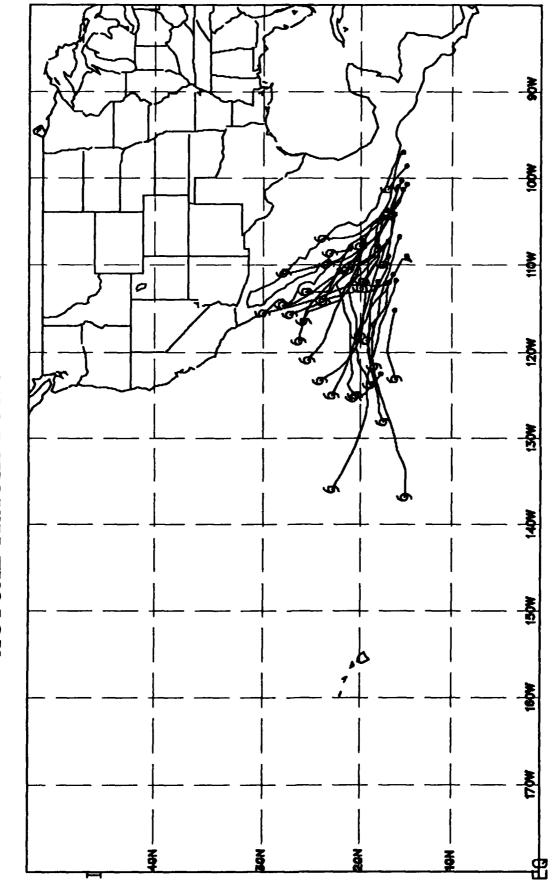
Numbers represent the percentage of tropical cyclones (> 33 kts) numbers may not add up to 100% since not all tropical cyclones develop/dissipate along a path. Tracks which contained less than (> 33 kts) follow a mean path and some develop/dis 5% of the tropical cyclones (> 33 kts) are ignored. Mean tropical cyclone (> 33 kts) path. I

ACTUAL TRACKS FOR SEP 9 - SEP 23



Actual path of straight tropical cyclones (>33 kts) developing south of 15°N.

ACTUAL TRACKS FOR SEP 9 - SEP 23

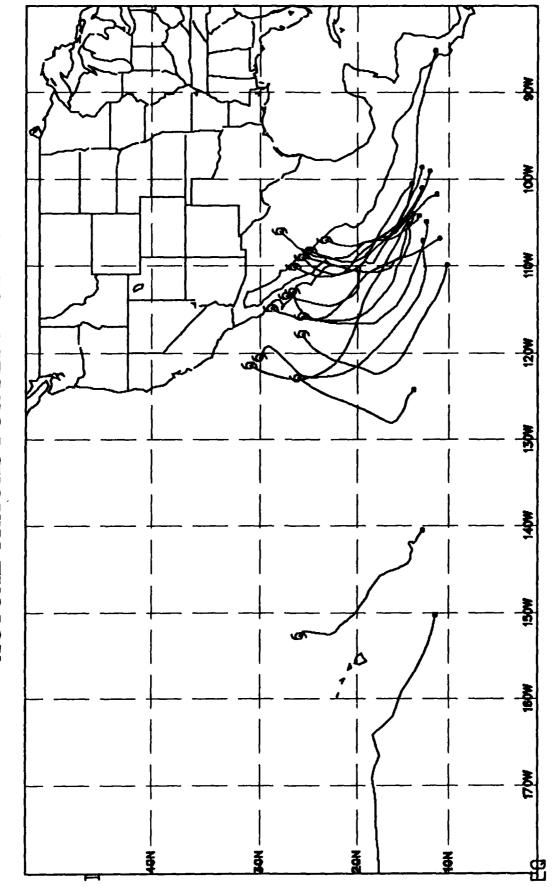


Actual path of straight tropical cyclones (> 33 kts) developing at or north of 150N.

ACTUAL TRACKS FOR SEP 9 - SEP 23

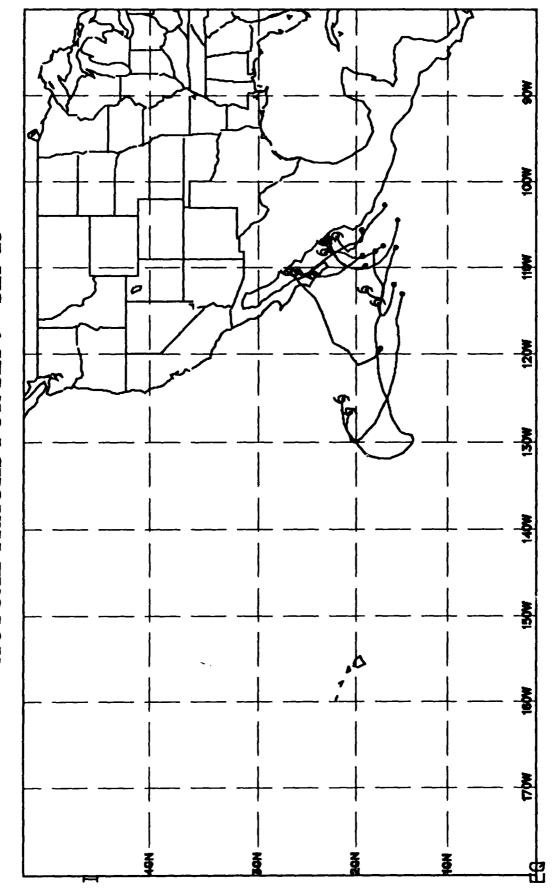
Actual path of all straight tropical cyclones (> 33 kts).

ACTUAL TRACKS FOR SEP 9 - SEP 23



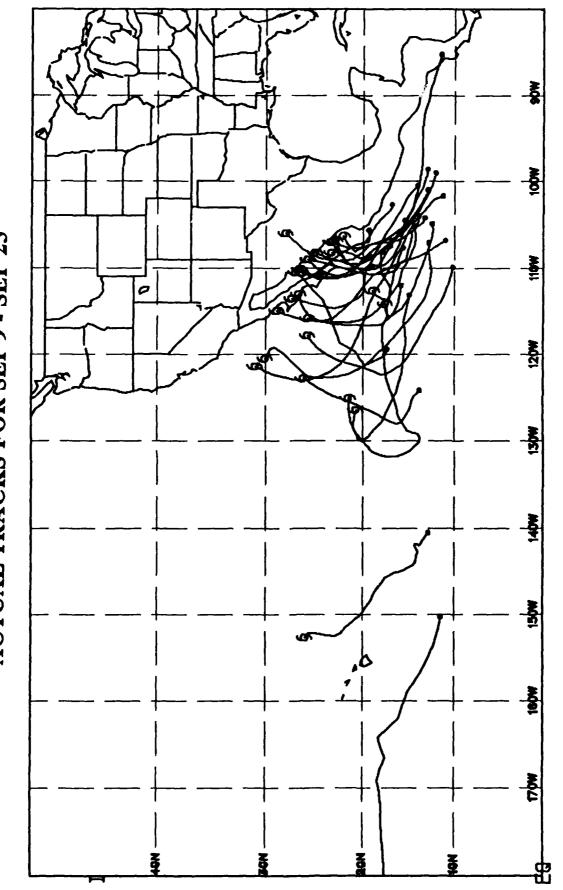
Actual path of recurving tropical cyclones (> 33 kts) developing south of 15°N.

ACTUAL TRACKS FOR SEP 9 - SEP 23



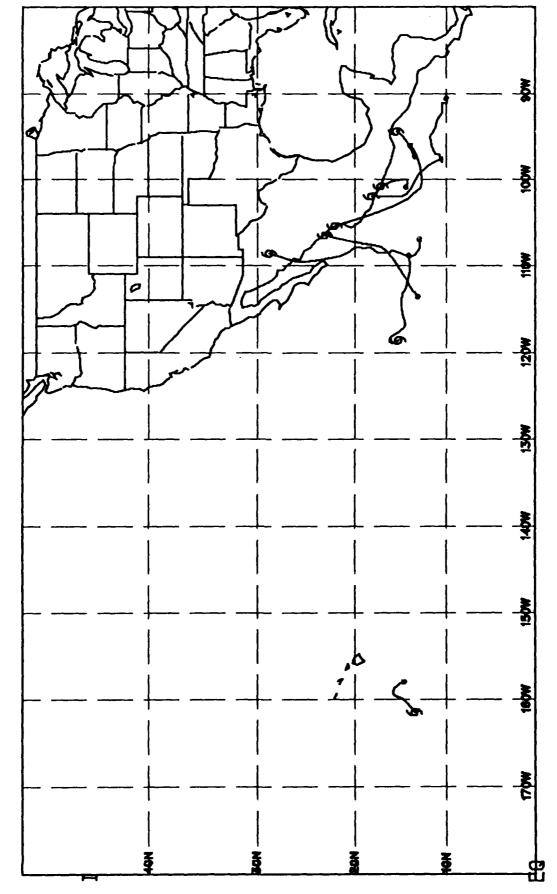
Actual path of recurving tropical cyclones (>33 kts) developing at or north of 150N.

ACTUAL TRACKS FOR SEP 9 - SEP 23



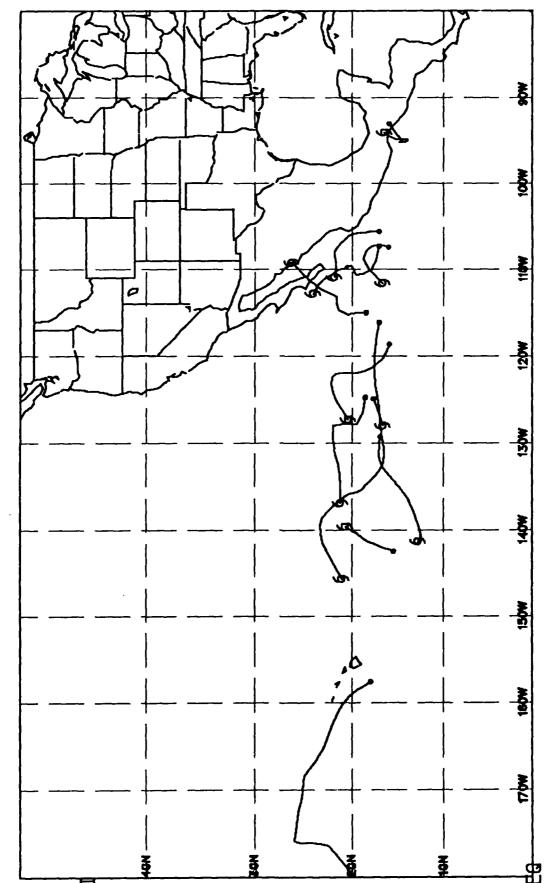
Actual path of all recurving tropical cyclones (> 33 kts).

ACTUAL TRACKS FOR SEP 9 - SEP 23



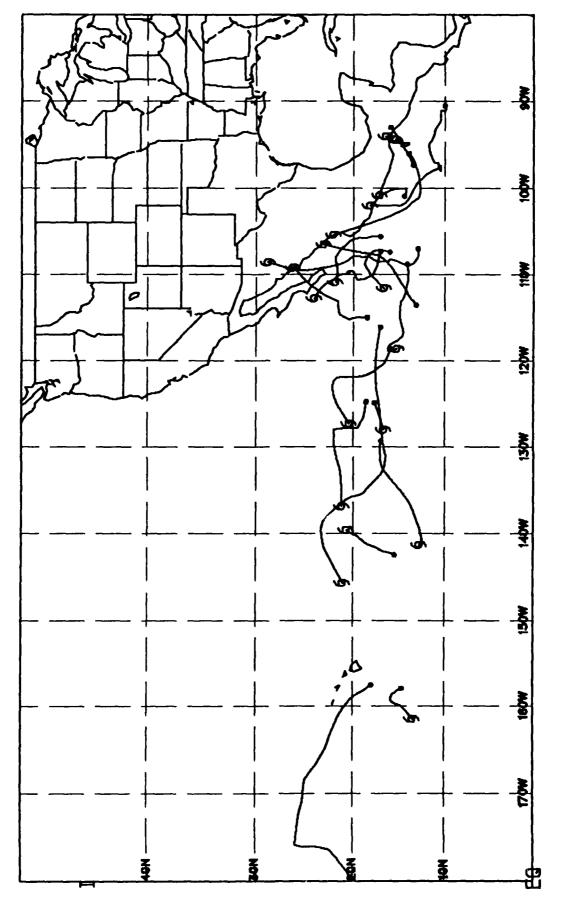
Actual path of other tropical cyclones (>33 kts) developing south of 15°N.

ACTUAL TRACKS FOR SEP 9 - SEP 23



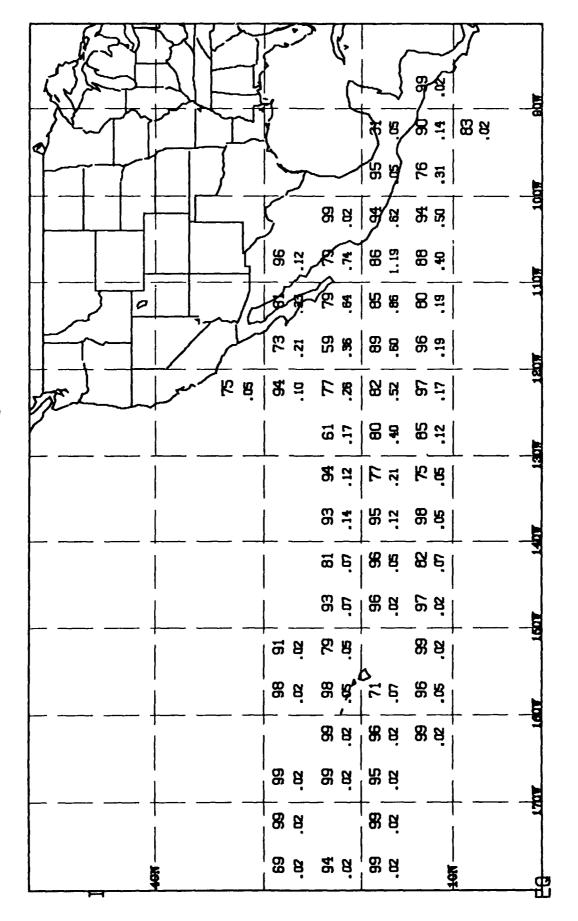
Actual path of other tropical cyclones (> 33 kts) developing at or north of 15°N.

ACTUAL TRACKS FOR SEP 9 - SEP 23



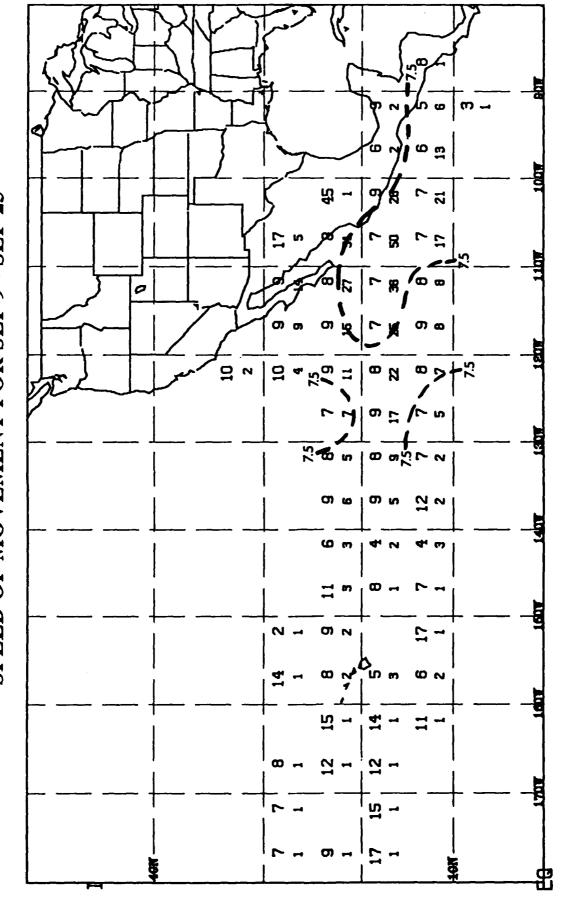
Actual path of all other tropical cyclones (>33 kts).

CONSTANCY AND RELATIVE FREQUENCY FOR SEP 9 - SEP 23



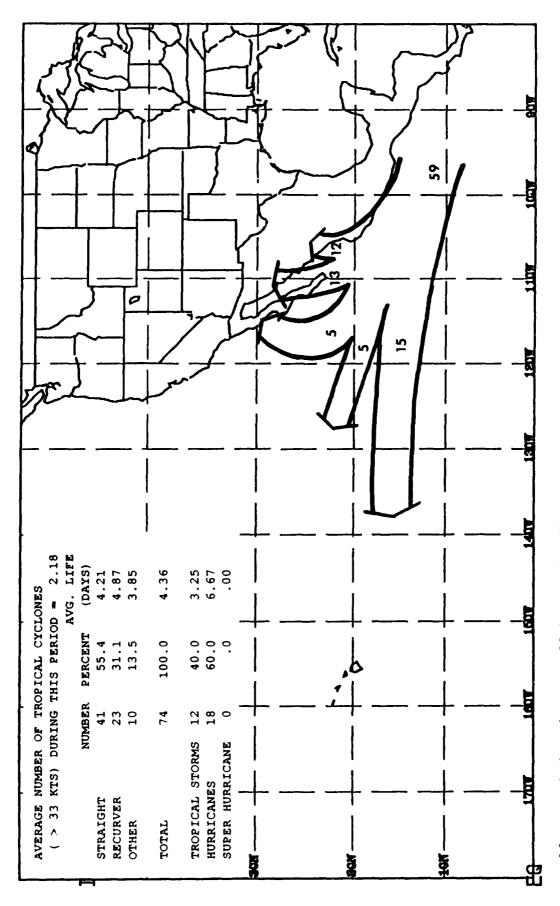
as the 12-hr average vector speed divided by the 12-hr average scalar speed. Is the number of tropical cyclones passing through the 5° latitude by 5° Tropical cyclone (> 33 kts) Constancy (top number) and Relative Frequency (bottom number). longitude square per year per time period. is Constancy is defined Relative Frequency i Frequency

SPEED OF MOVEMENT FOR SEP 9 - SEP 23



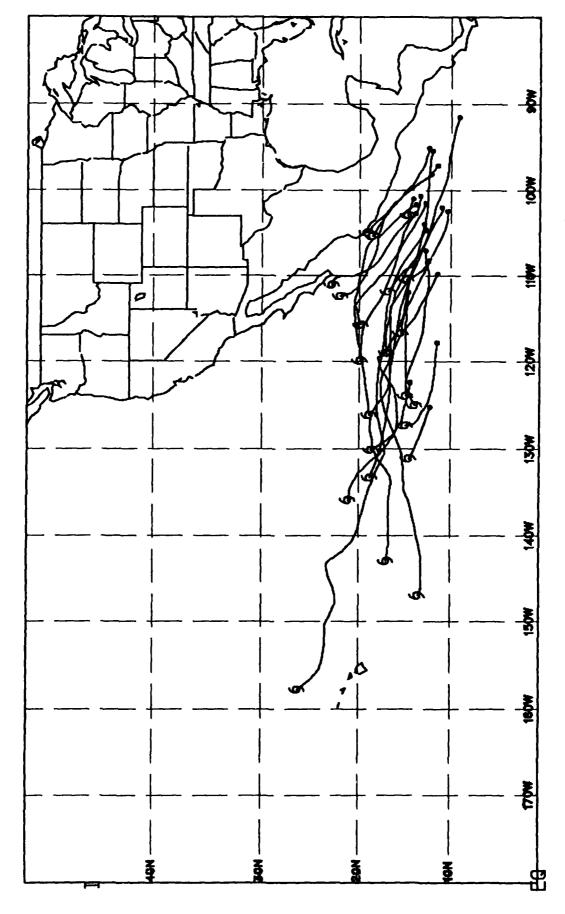
Average tropical cyclone (> 33 kts) Speed (top number) in knots and sample size (bottom number) for each 5° latitude by 5° longitude square. Contours are drawn only to those squares containing at least 5% of the sample.

MEAN PATHS FOR SEP 24 - OCT 8

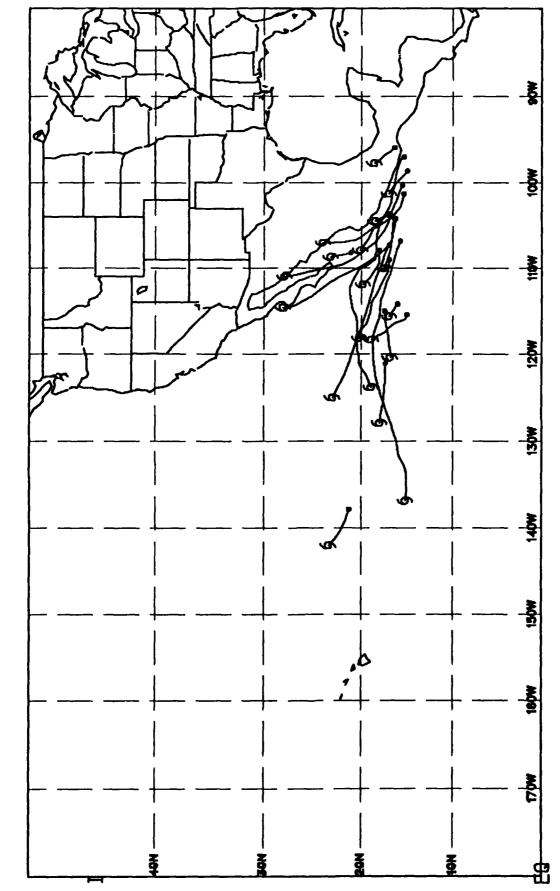


Numbers represent the percentage of tropical cyclones (> 33 kts) numbers may not add up to 100% since not all tropical cyclones develop/dissipate along a path. Tracks which contained less than which followed the indicated path. These numbers in (> 33 kts) follow a mean path and some develop/dis 5% of the tropical cyclones (> 33 kts) are ignored. Mean tropical cyclone (> 33 kts) path.

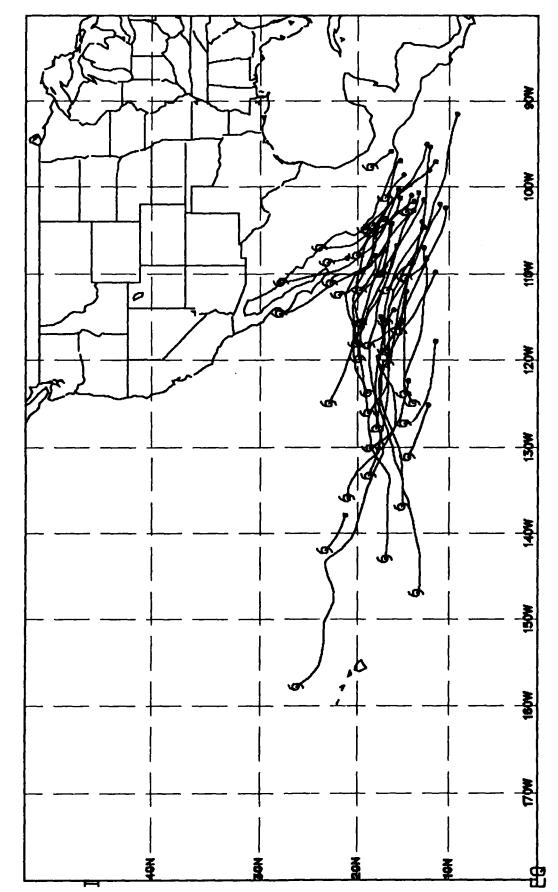
E-141



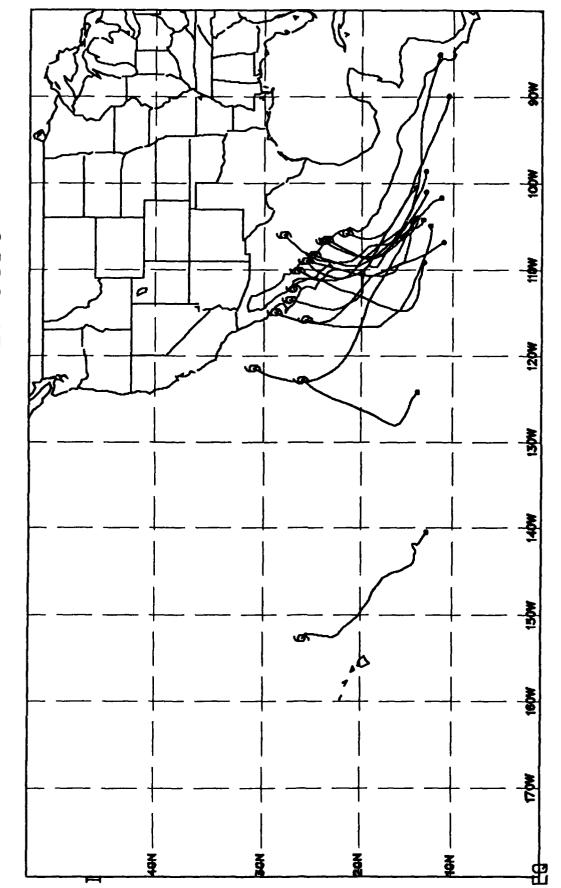
Actual path of straight tropical cyclones (> 33 kts) developing south of 159N.



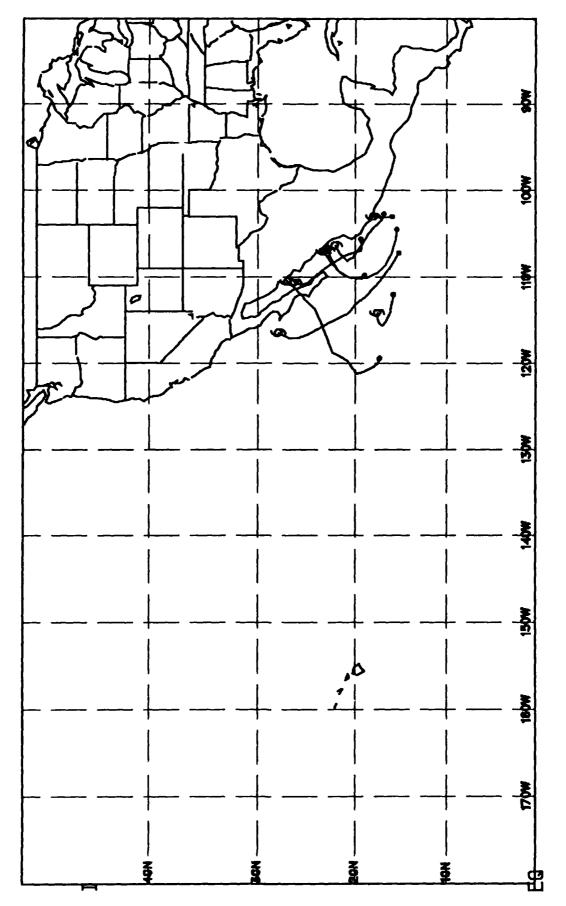
Actual path of straight tropical cyclones (> 33 kts) developing at or north of 15°N.



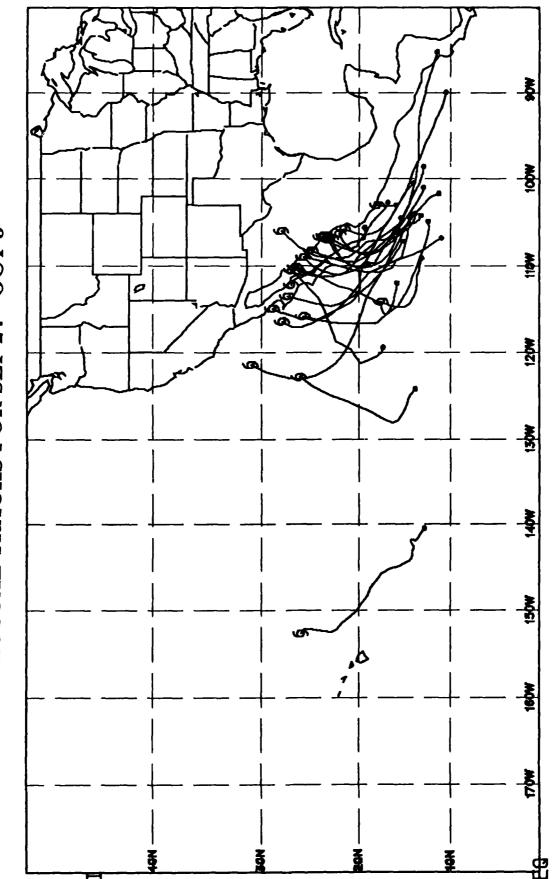
Actual path of all straight tropical cyclones (>33 kts).



Actual path of recurving tropical cyclones (> 33 kts) developing south of 15°N.

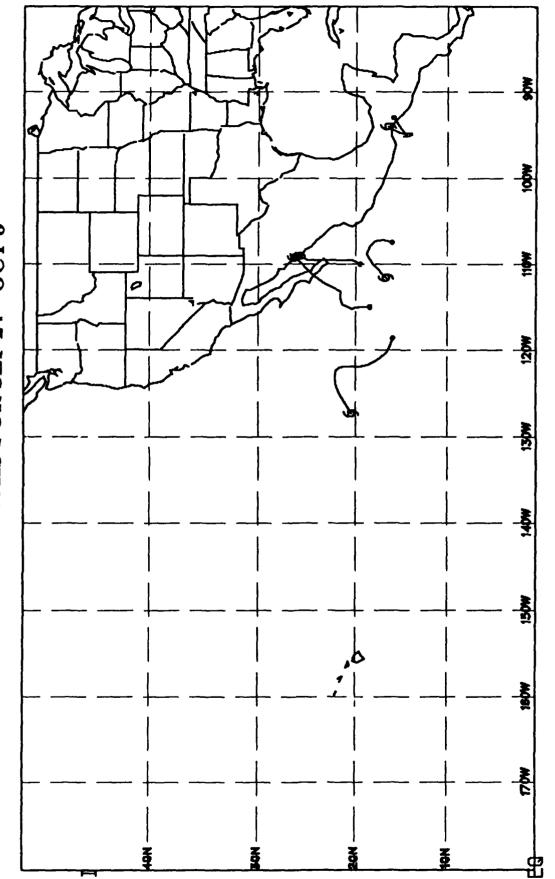


Actual path of recurving tropical cyclones (>33 kts) developing at or north of 15°N.

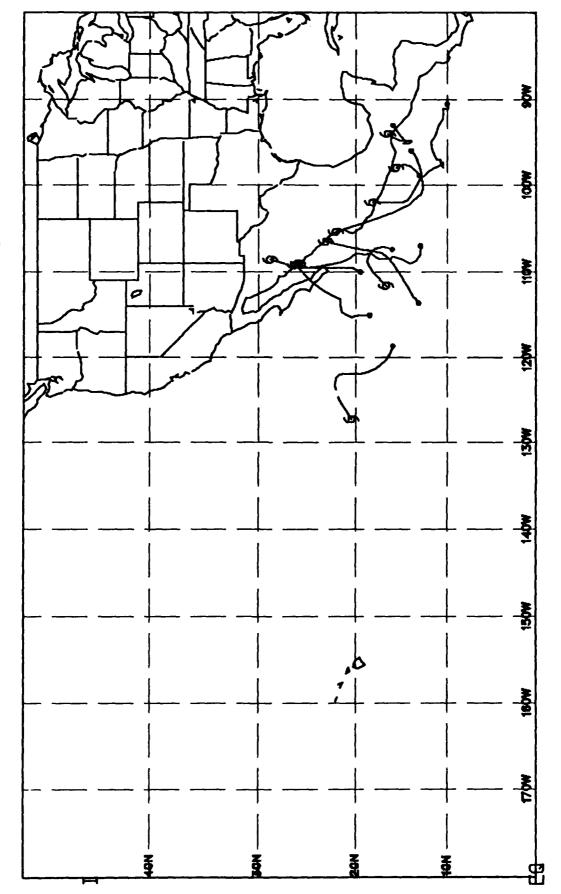


Actual path of all recurving tropical cyclones (> 33 kts).

Actual path of other tropical cyclones (>33 kts) developing south of 15°N.

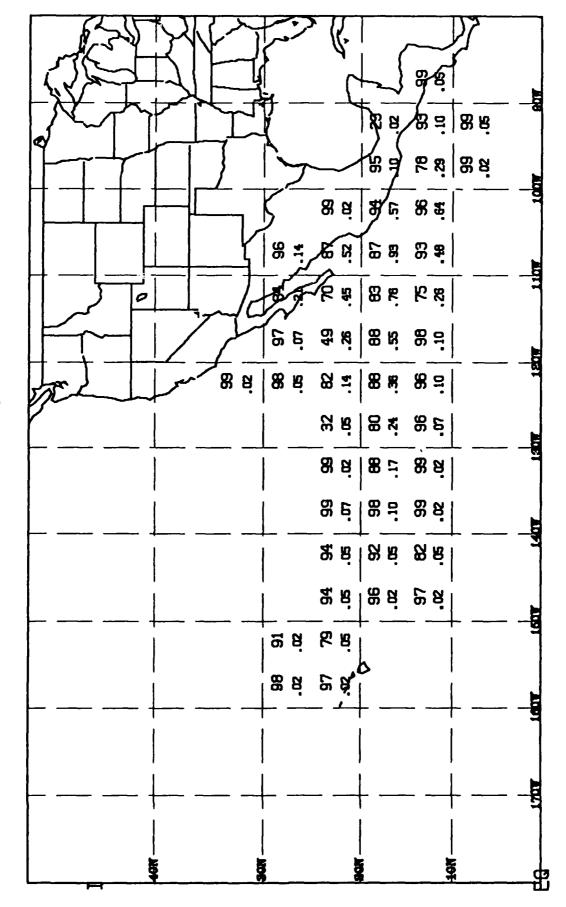


Actual path of other tropical cyclones (> 33 kts) developing at or north of 15°N.



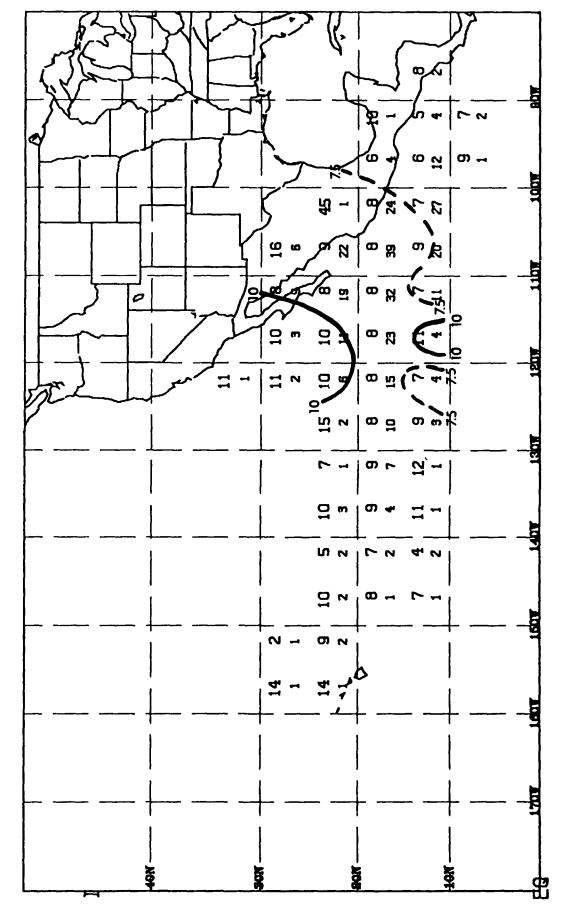
Actual path of all other tropical cyclones (>33 kts).

CONSTANCY AND RELATIVE FREQUENCY FOR SEP 24 - OCT 8



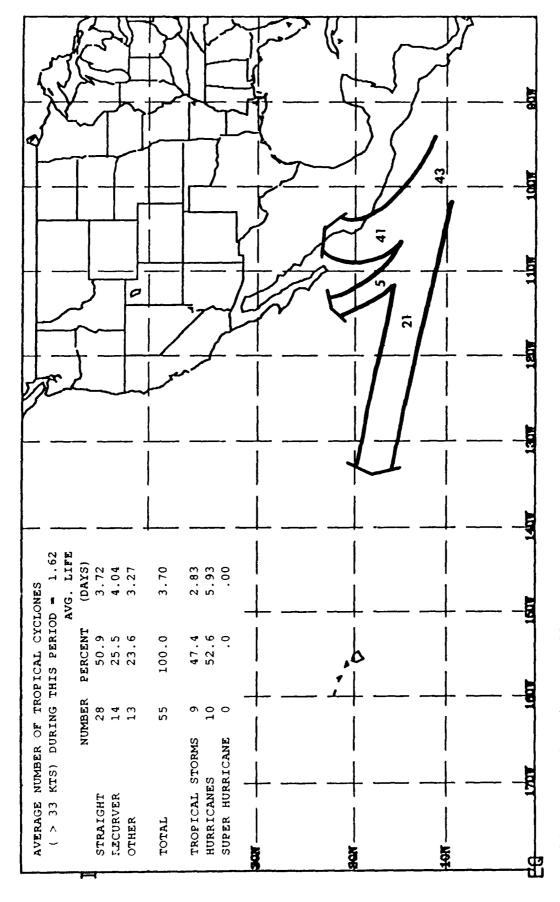
> 33 kts) Constancy (top number) and Relative Frequency (voucom named) as the 12-hr average scalar speed. Relative Frequency is the number of longitude square per year per time period. Tropical cyclone (: Constancy is defined Relative Frequency is

SPEED OF MOVEMENT FOR SEP 24 - OCT 8

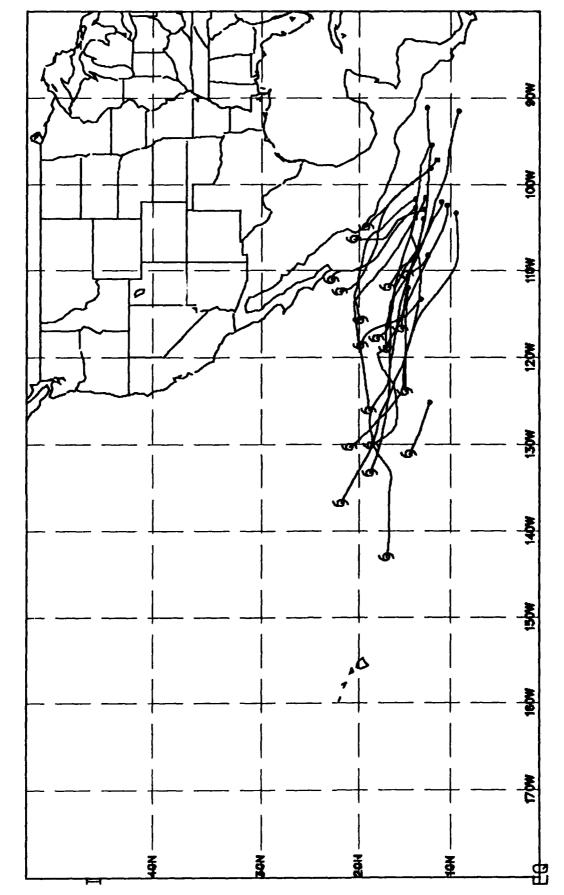


Average tropical cyclone (> 33 kts) Speed (top number) in knots and sample size (bottom number) for each 50 latitude by 50 longitude square. Contours are drawn only to those squares containing at least 5% of the sample.

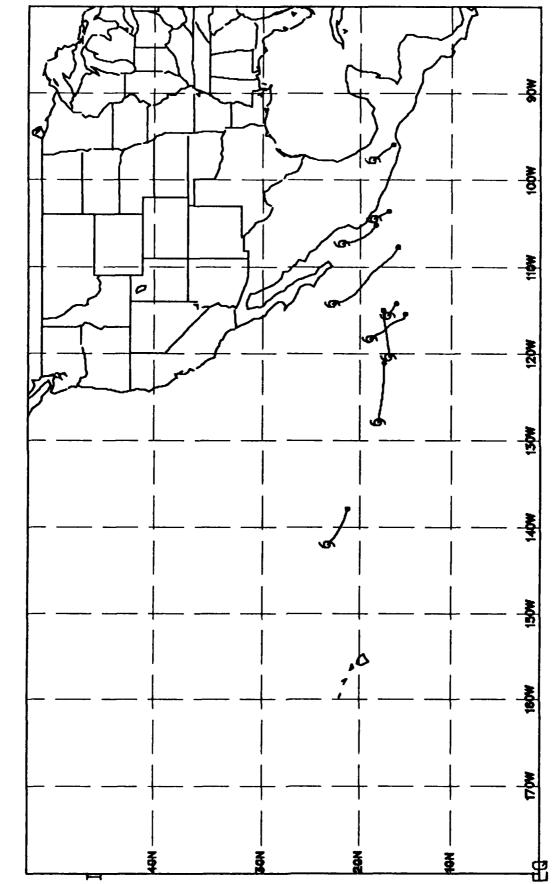
MEAN PATHS FOR OCT 9 - OCT 23



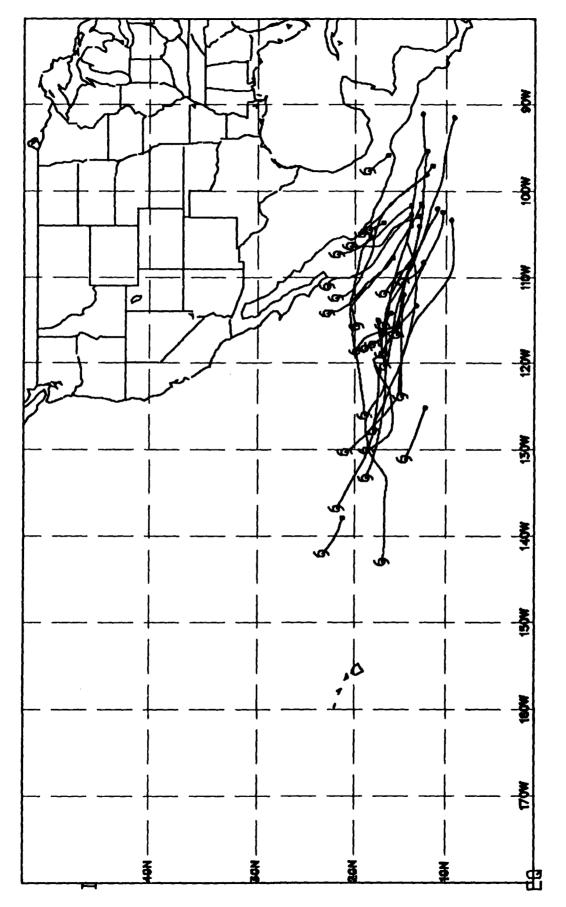
since not all tropical cyclones numbers may not add up to 100% since not all tropical cyclones develop/dissipate along a path. Tracks which contained less than Numbers represent the percentage of tropical cyclones (> 33 kts) (> 33 kts) follow a mean path and some develop/dis 5% of the tropical cyclones (> 33 kts) are ignored. Mean tropical cyclone (> 33 kts) path. which followed the indicated path. These



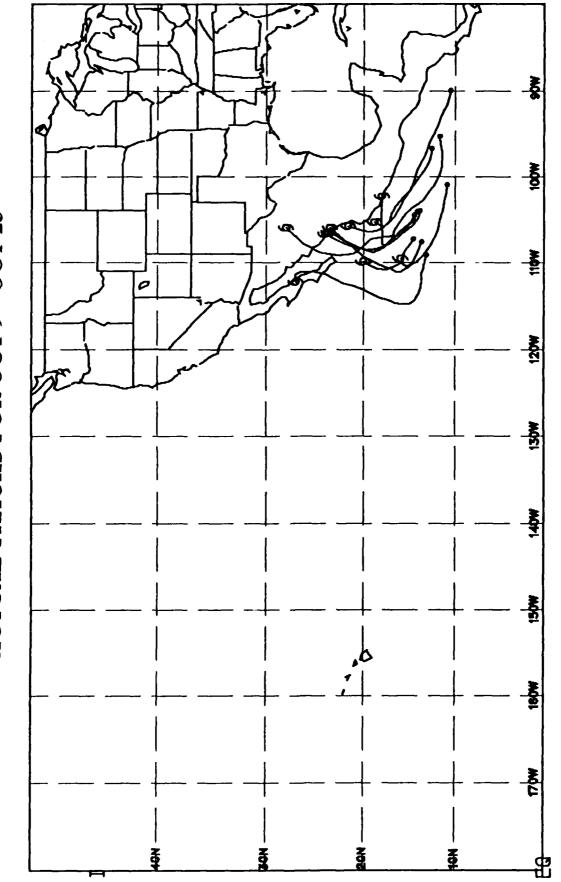
Actual path of straight tropical cyclones (>33 kts) developing south of 150N.



Actual path of straight tropical cyclones (>33 kts) developing at or north of 15°N.

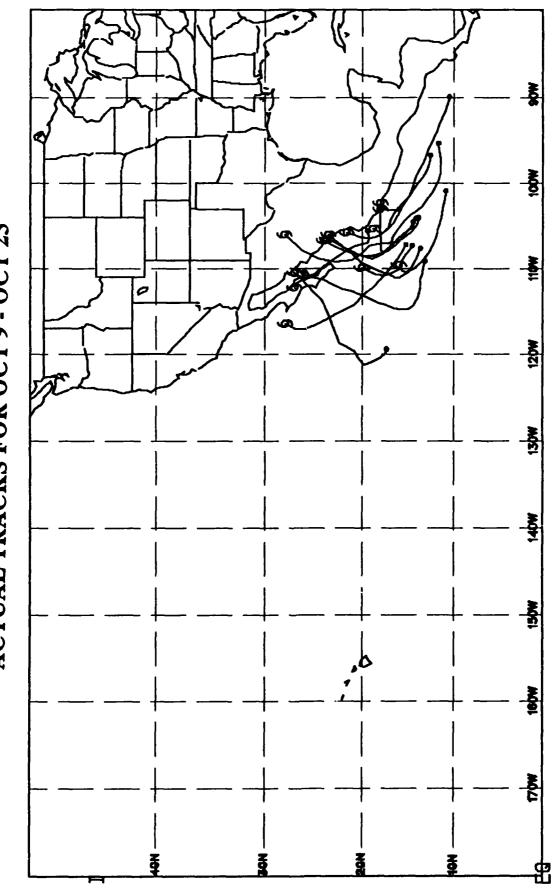


Actual path of all straight tropical cyclones (>33 kts).



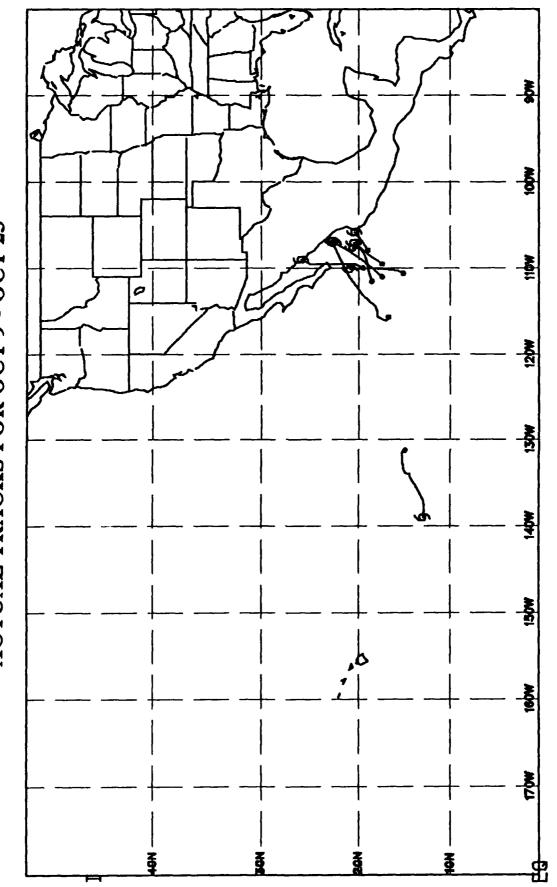
Actual path of recurving tropical cyclones (>33 kts) developing south of 150N.

Actual path of recurving tropical cyclones (>33 kts) developing at or north of 15°N.

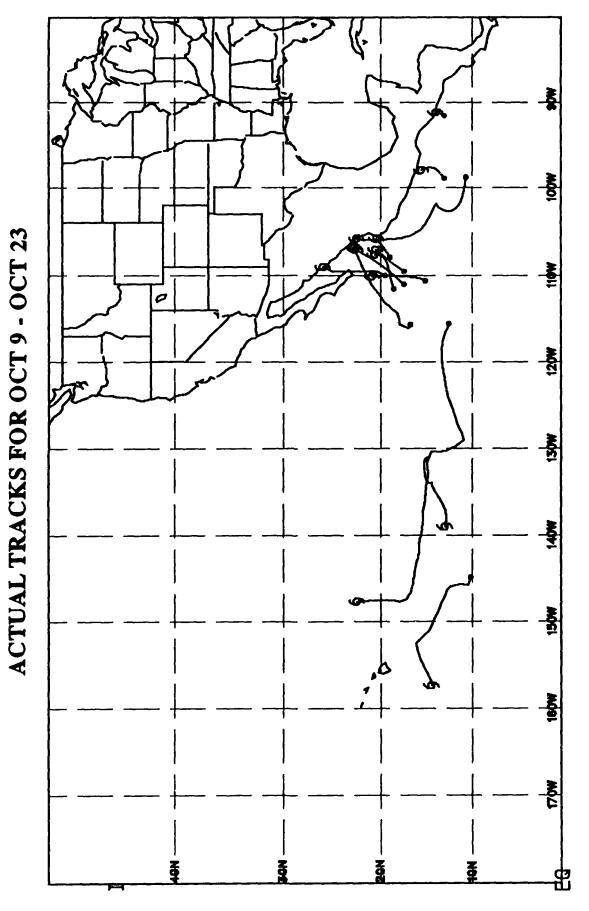


Actual path of all recurving tropical cyclones (> 33 kts).

Actual path of other tropical cyclones (> 33 kts) developing south of 15°N.

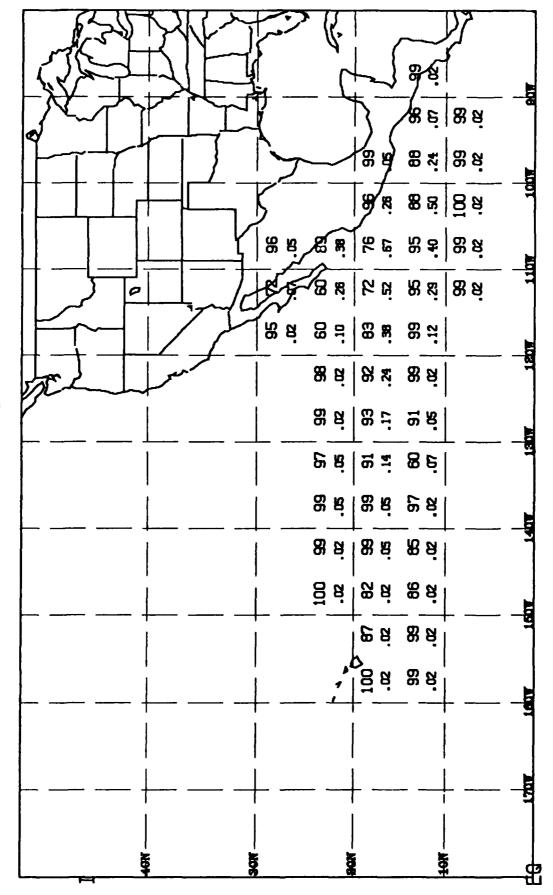


Actual path of other tropical cyclones (>33 kts) developing at or north of 15°N.



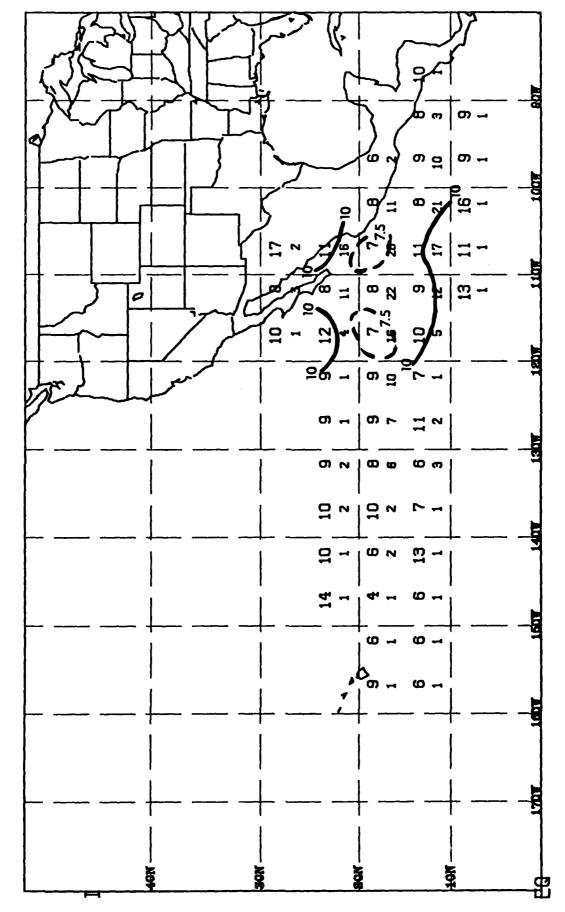
Actual path of all other tropical cyclones (>33 kts).

CONSTANCY AND RELATIVE FREQUENCY FOR OCT 9 - OCT 23



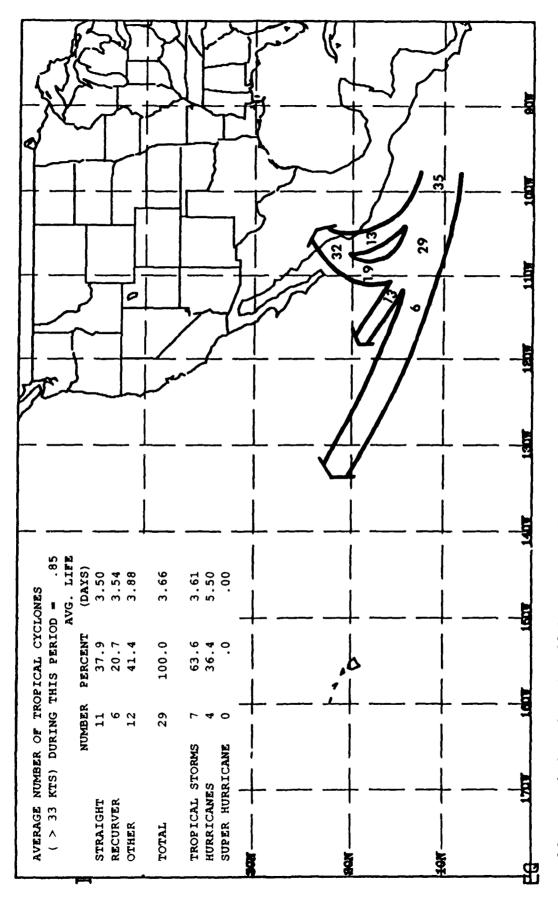
> 33 kts) Constancy (top number) and Relative Frequency (bottom number). as the 12-hr average vector speed divided by the 12-hr average scalar speed. is the number of tropical cyclones passing through the 50 latitude by 50 longitude square per year per time period. 13 Constancy is defined Frequency Tropical cyclone (Relative

SPEED OF MOVEMENT FOR OCT 9 - OCT 23

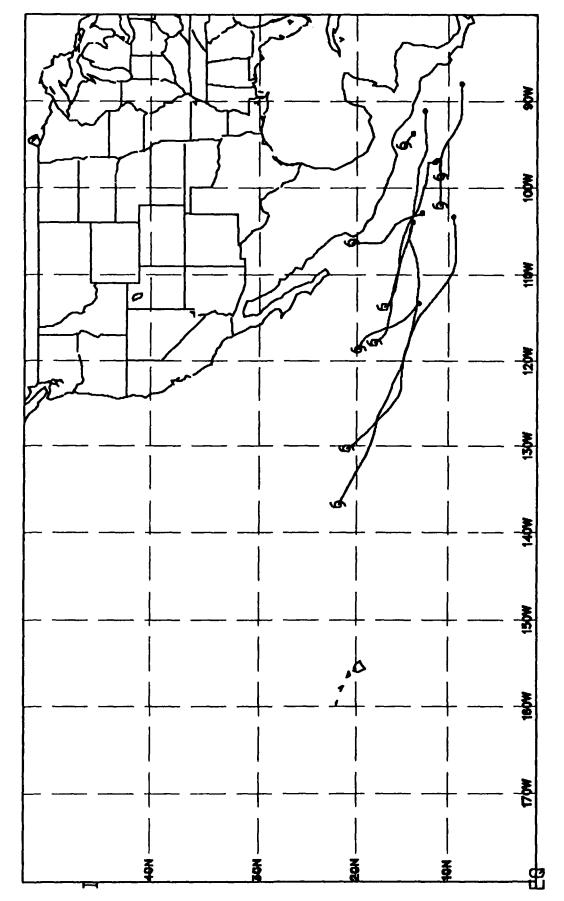


Average tropical cyclone (> 33 kts) Speed (top number) in knots and sample size (bottom number) for each 5° latitude by 5° longitude square. Contours are drawn only to those squares containing at least 5% of the sample.

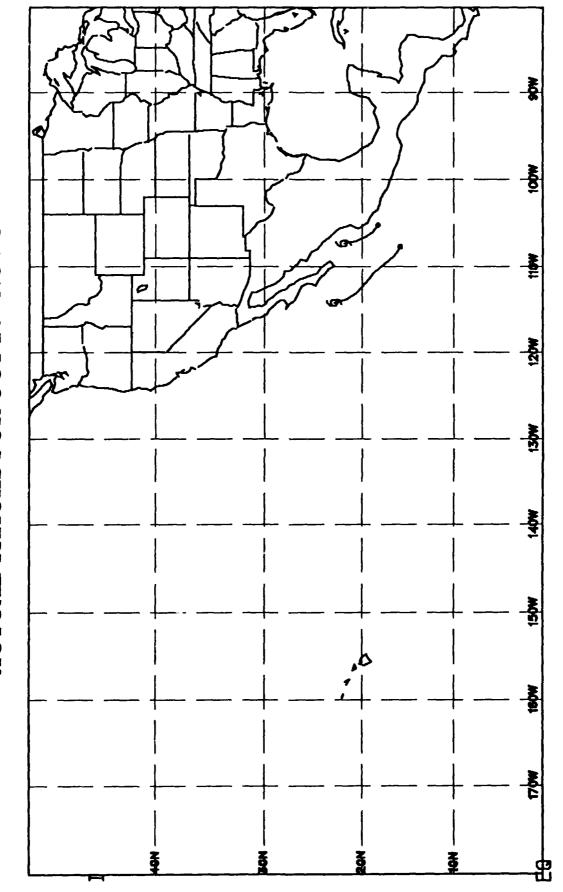
MEAN PATHS FOR OCT 24 - NOV 8



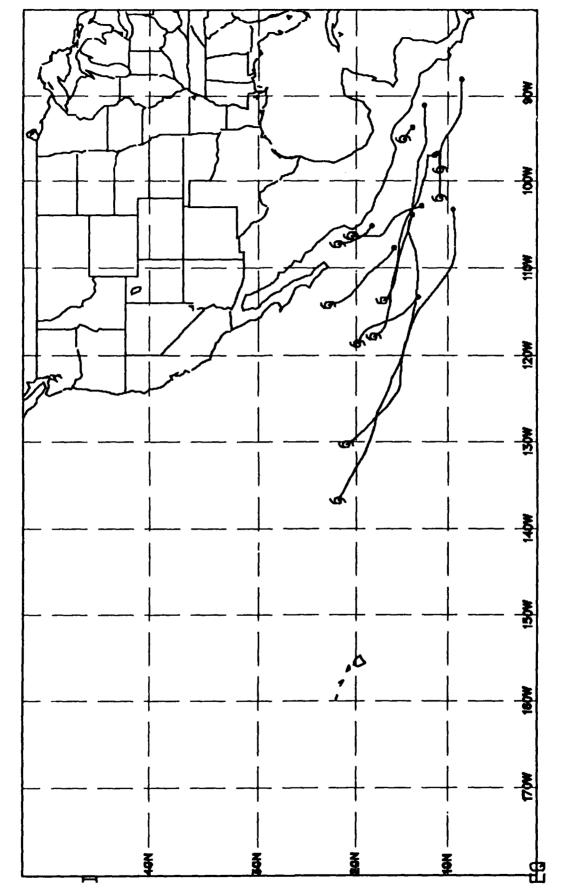
Numbers represent the percentage of tropical cyclones (> 33 kts) numbers may not add up to 100% since not all tropical cyclones develop/dissipate along a path. Tracks which contained less than develop/dissipate along a path. (> 33 kts) follow a mean path and some develop/dis 5% of the tropical cyclones (> 33 kts) are ignored. Mean tropical cyclone (> 33 kts) path. which followed the indicated path. These



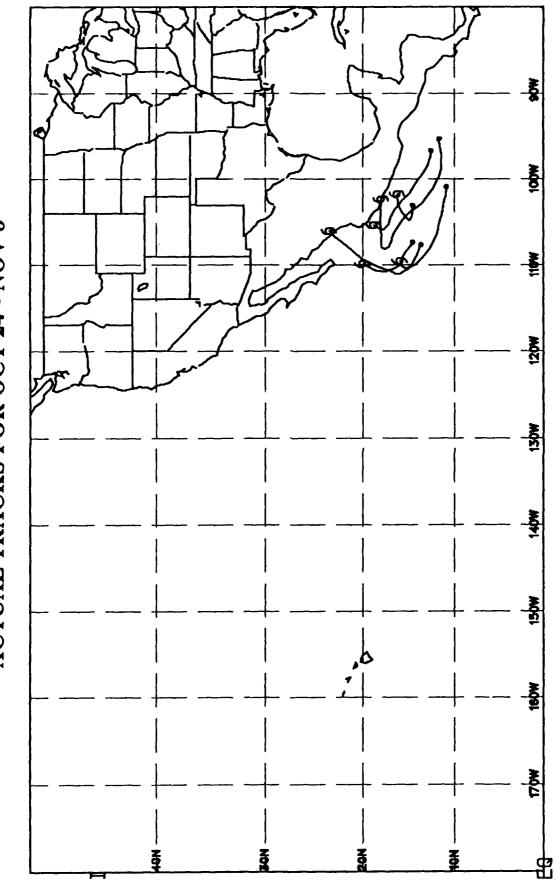
Actual path of straight tropical cyclones (> 33 kts) developing south of 15°N.



Actual path of straight tropical cyclones (>33 kts) developing at or north of 15°N.

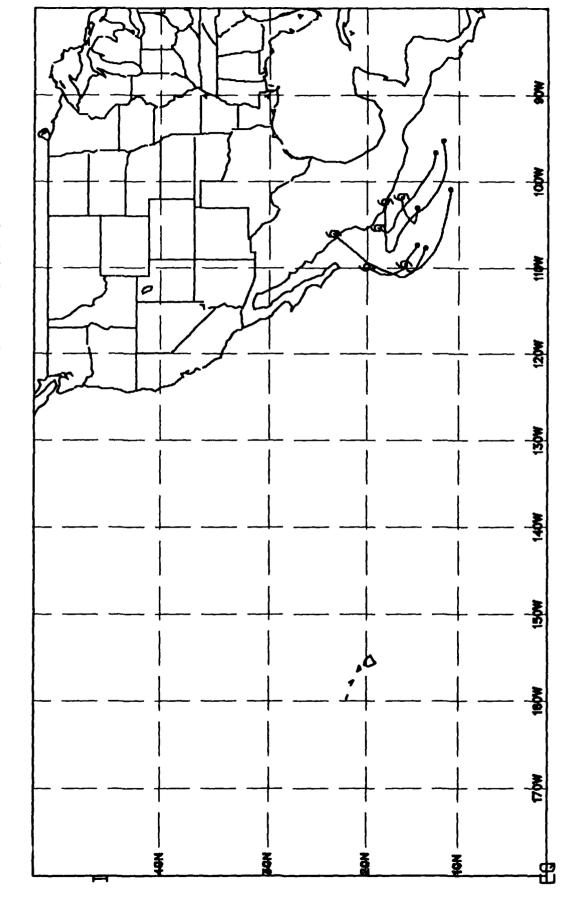


Actual path of all straight tropical cyclones (> 33 kts).

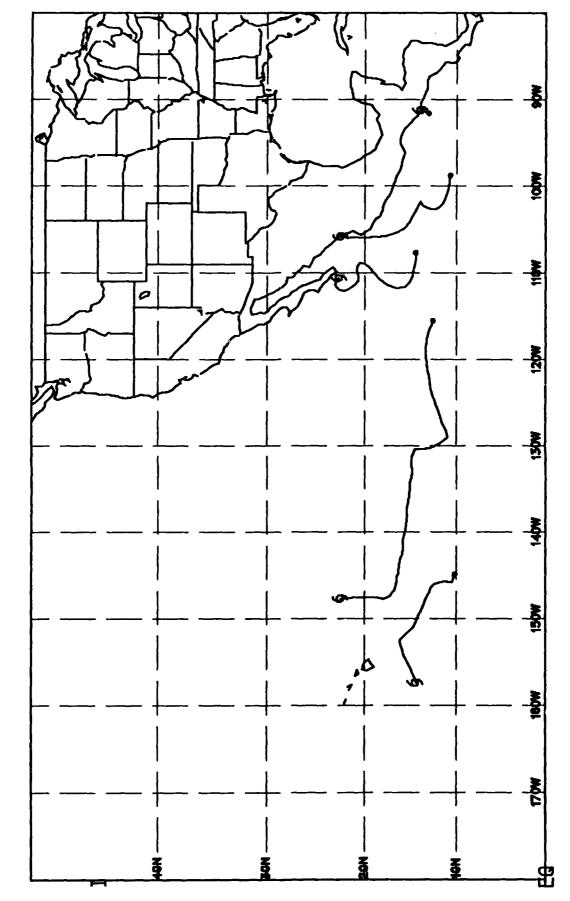


Actual path of recurving tropical cyclones (>33 kts) developing south of 150N.

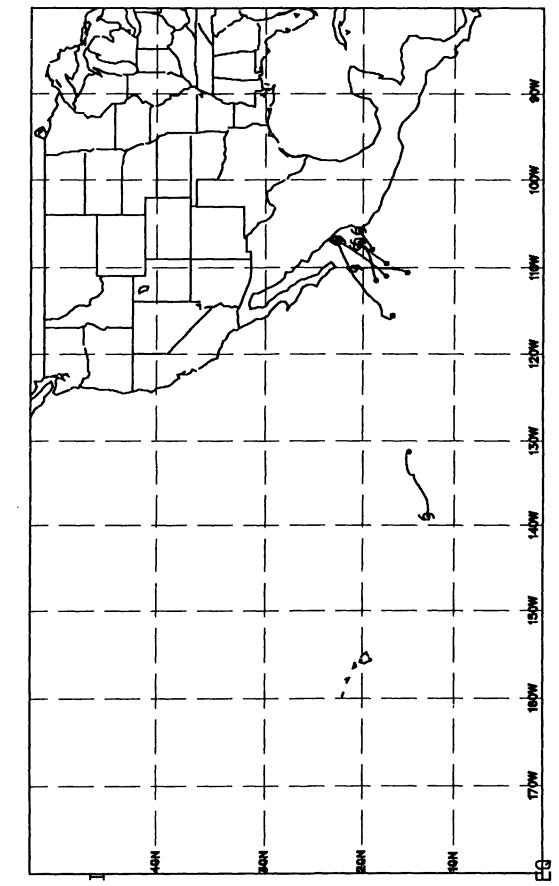
Actual path of recurving tropical cyclones (>33 kts) developing at or north of 15°N.



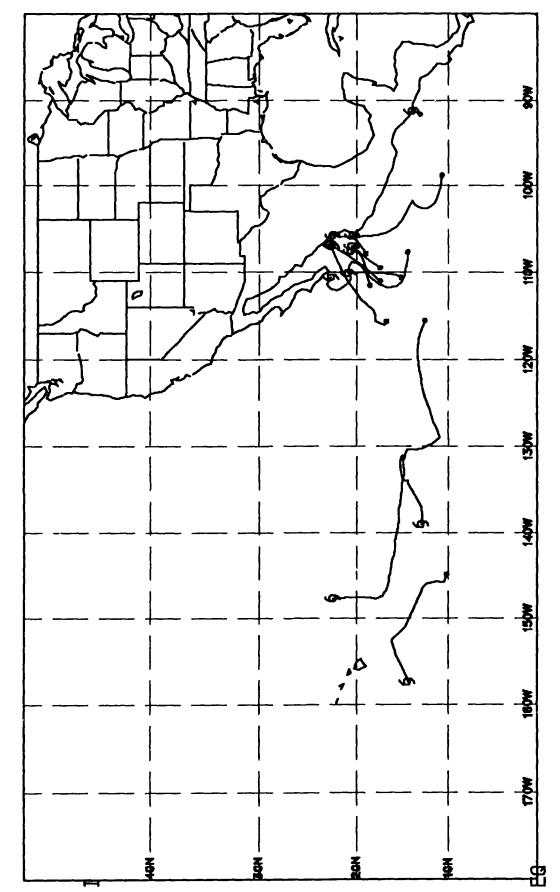
Actual path of all recurving tropical cyclones (> 33 kts).



Actual path of other tropical cyclones (>33 kts) developing south of 15°N.

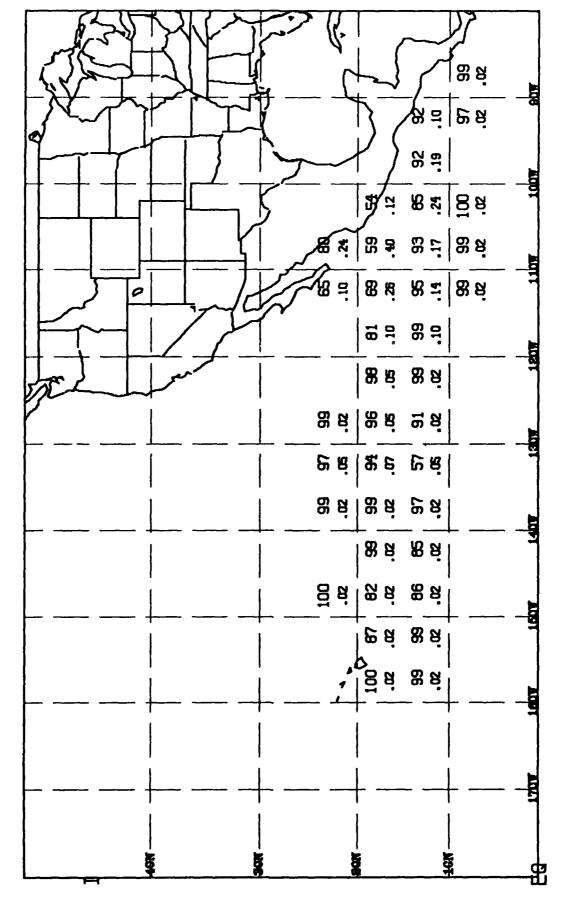


Actual path of other tropical cyclones (>33 kts) developing at or north of 150N.



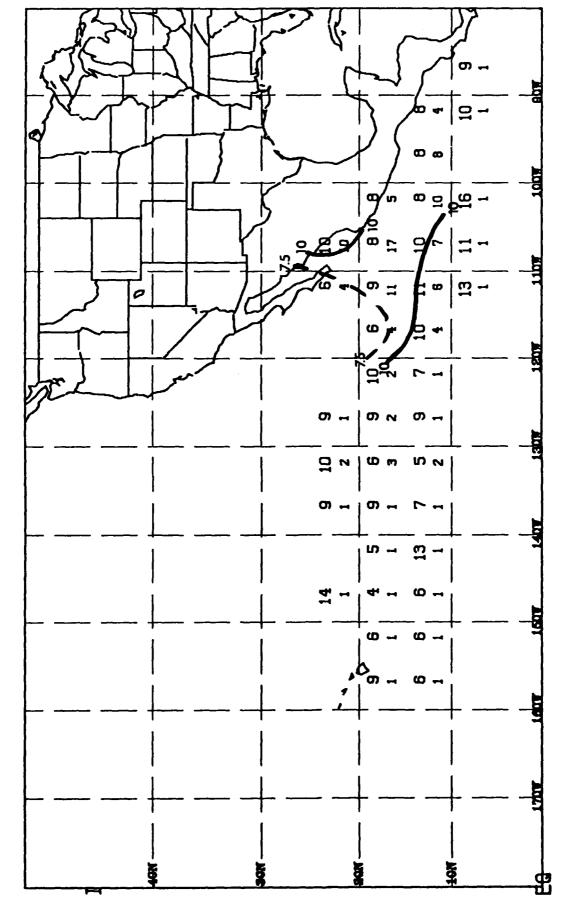
Actual path of all other tropical cyclones (> 33 kts).

CONSTANCY AND RELATIVE FREQUENCY FOR OCT 24 - NOV 8



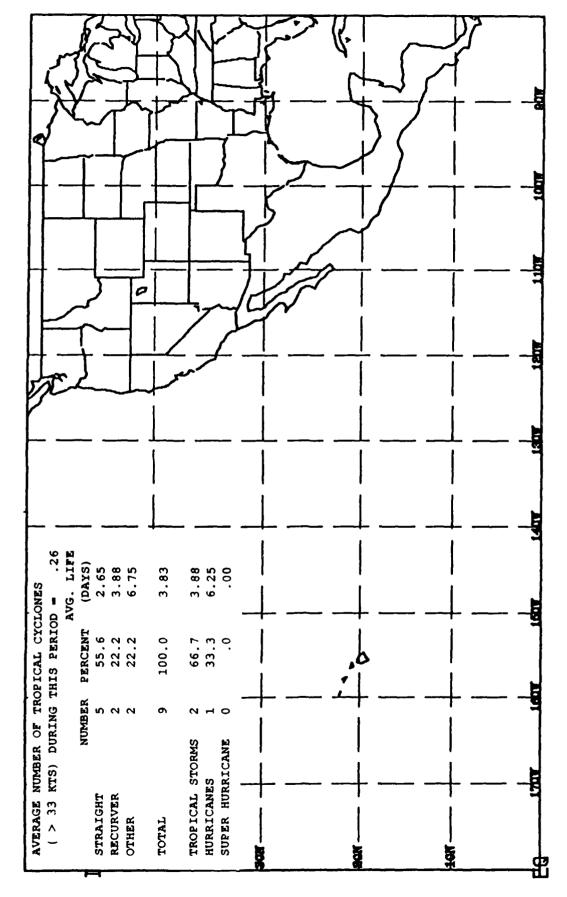
> 33 kts) Constancy (top number) and Relative Frequency (bottom number). as the 12-hr average vector speed divided by the 12-hr average scalar speed. Is the number of tropical cyclones passing through the 50 latitude by 50 cyclones passing through the > 33 kts) Constancy (top number) longitude square per year per time period. is. Constancy is defined Frequency Tropical cyclone (Relative

SPEED OF MOVEMENT FOR OCT 24 - NOV 8

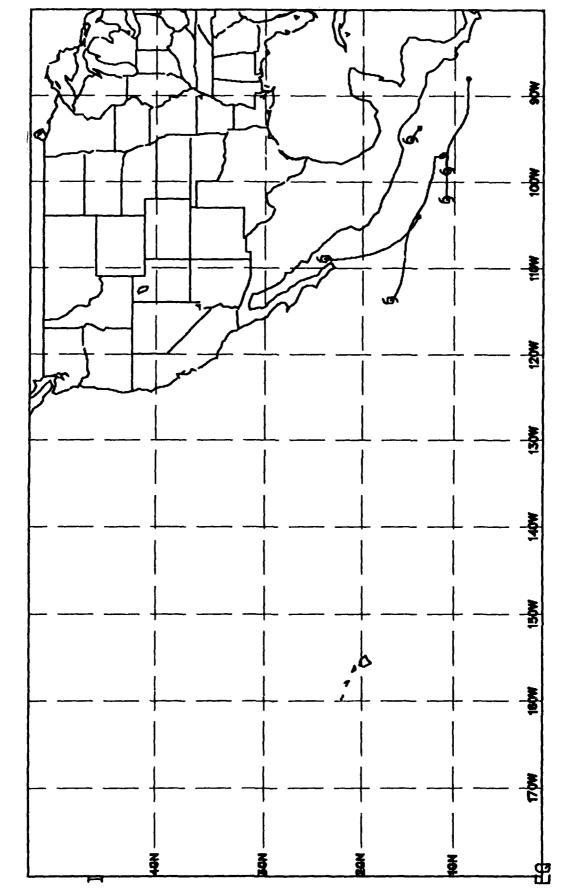


Average tropical cyclone (> 33 kts) Speed (top number) in knots and sample size (bottom number) for each 5° latitude by 5° longitude square. Contours are drawn only to those squares containing at least 5% of the sample.

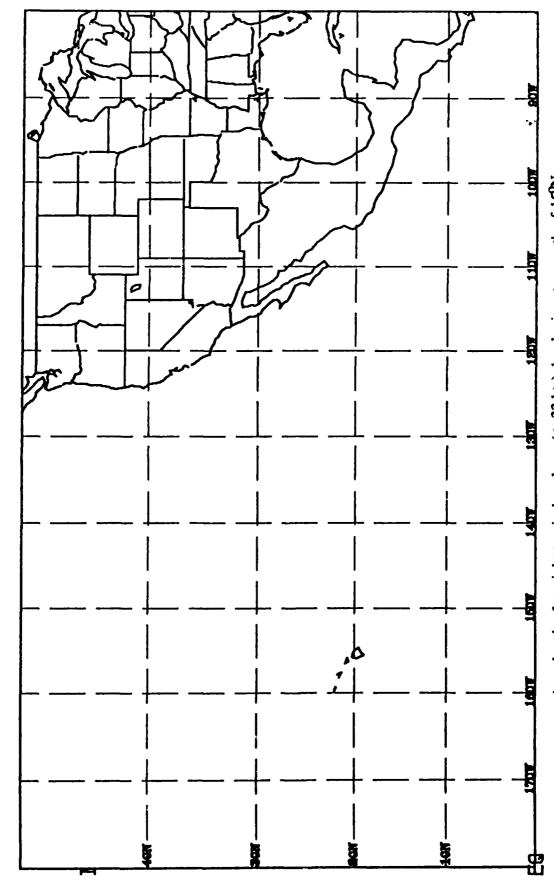
MEAN PATHS FOR NOV 9 - NOV 23



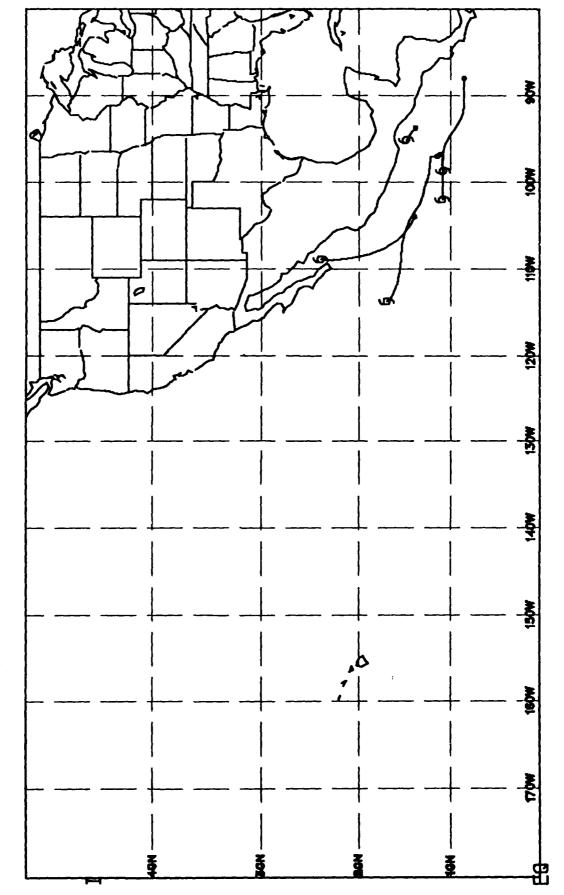
Numbers represent the percentage of tropical cyclones (> 33 kts) numbers may not add up to 100% since not all tropical cyclones develop/dissipate along a path. Tracks which contained less than are ignored. Mean tropical cyclone (> 33 kts) path. which followed the indicated path. These (> 33 kts) follow a mean path and some 5% of the tropical cyclones (> 33 kts)



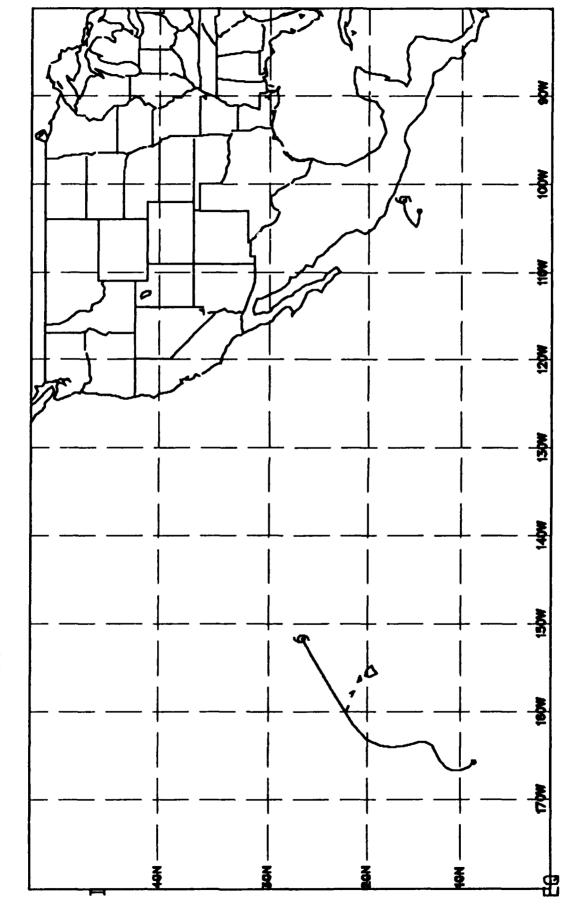
Actual path of straight tropical cyclones (>33 kts) developing south of 15°N.



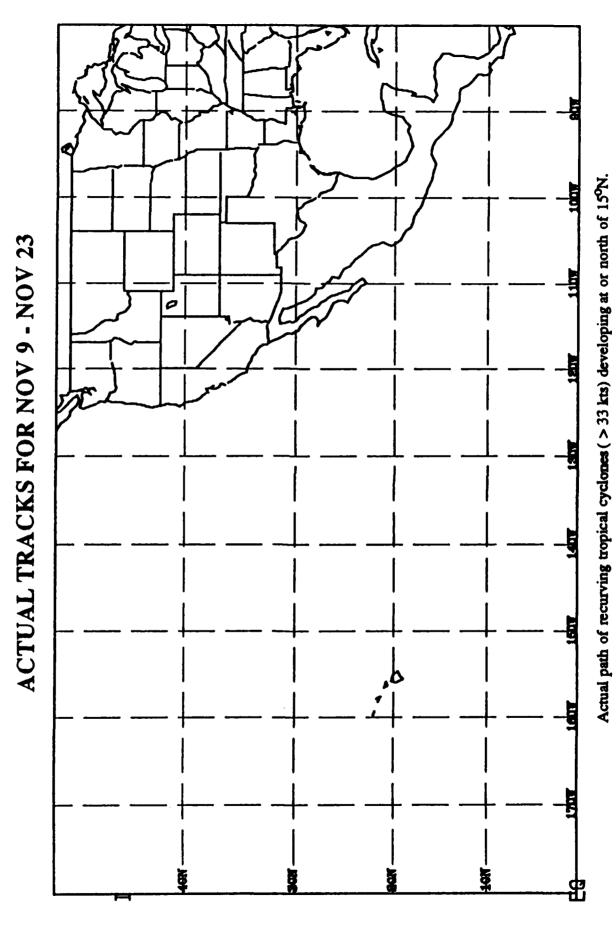
Actual path of straight tropical cyclones (> 33 kts) developing at or north of 15°N.



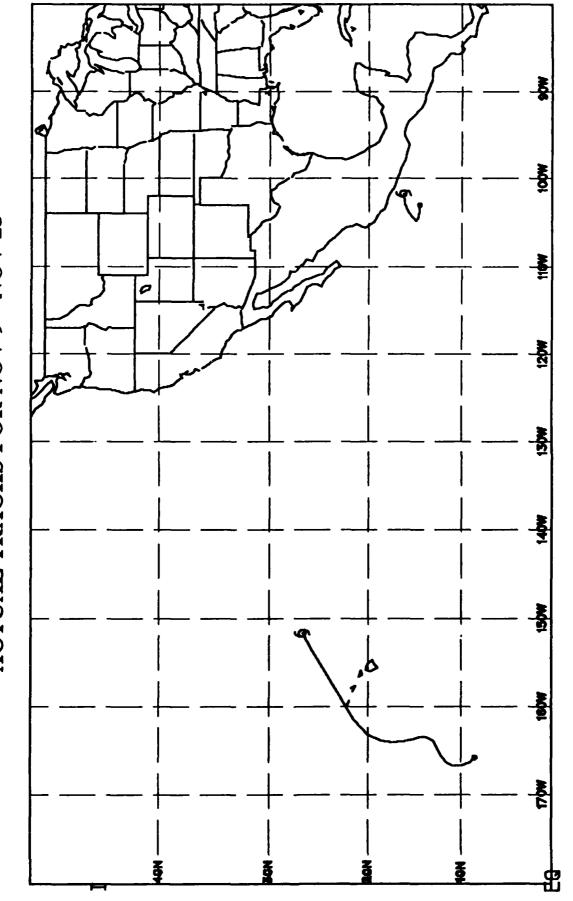
Actual path of all straight tropical cyclones (> 33 kts).



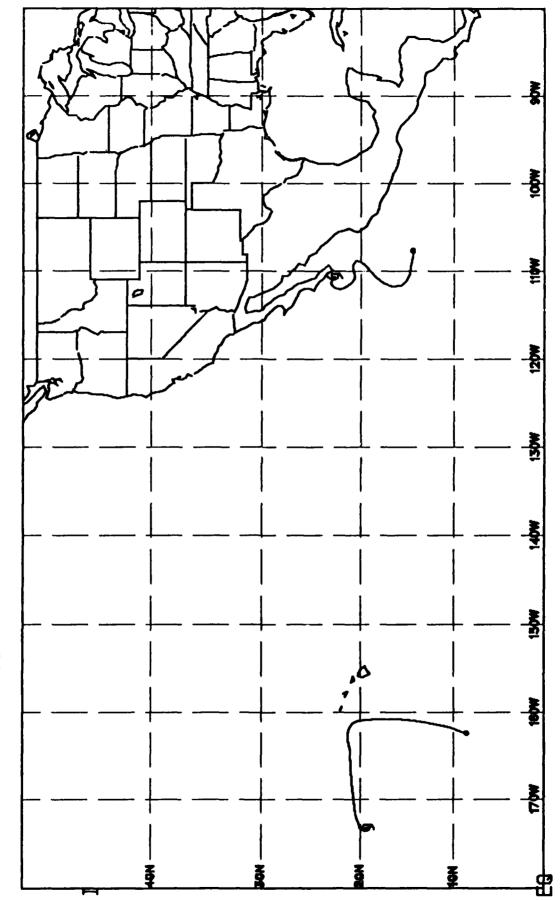
Actual path of recurving tropical cyclones (>33 kts) developing south of 15°N.



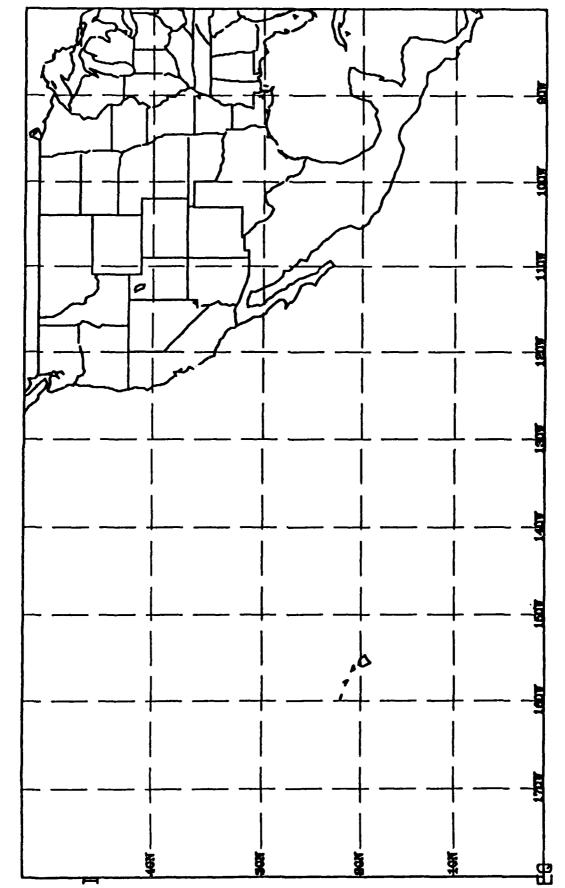
E-182



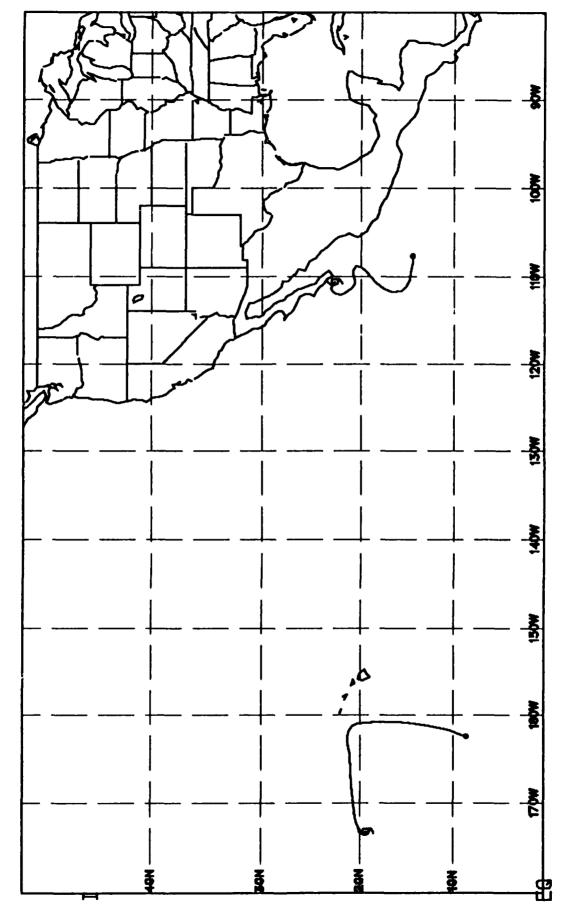
Actual path of all recurving tropical cyclones (>33 kts).



Actual path of other tropical cyclones (> 33 kts) developing south of 150N.

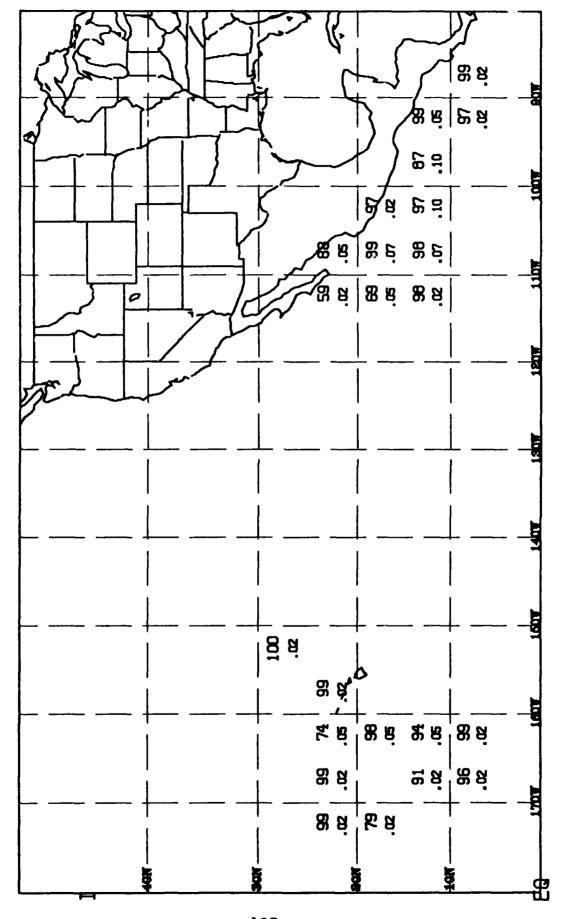


Actual path of other tropical cyclones (> 33 kts) developing at or north of 15°N.



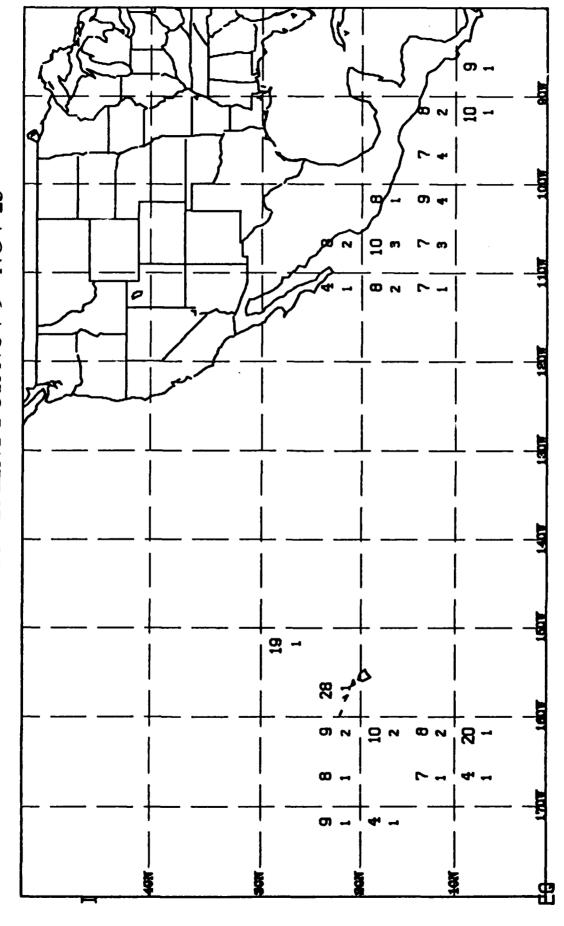
Actual path of all other tropical cyclones (>33 kts).

CONSTANCY AND RELATIVE FREQUENCY FOR NOV 9 - NOV 23



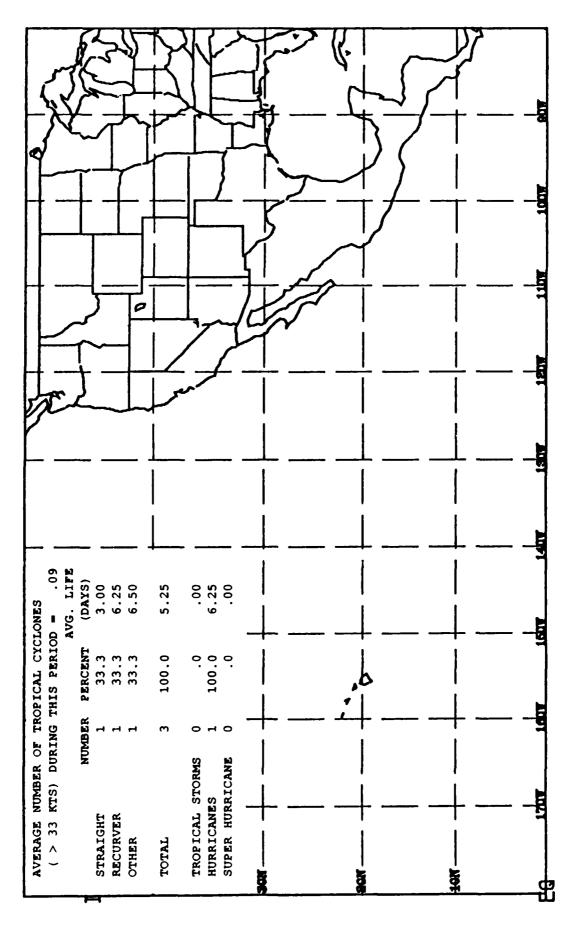
 \sim 33 kts) Constancy (top number) and Relative Frequency (bottom number). as the 12-hr average vector speed divided by the 12-hr average scalar speed. s the number of tropical cyclones passing through the 5° latitude by 5° number of tropical cyclones passing through the Relative Frequency is the number of longitude square per year per time period. Constancy is defined cyclone Tropical

SPEED OF MOVEMENT FOR NOV 9 - NOV 23

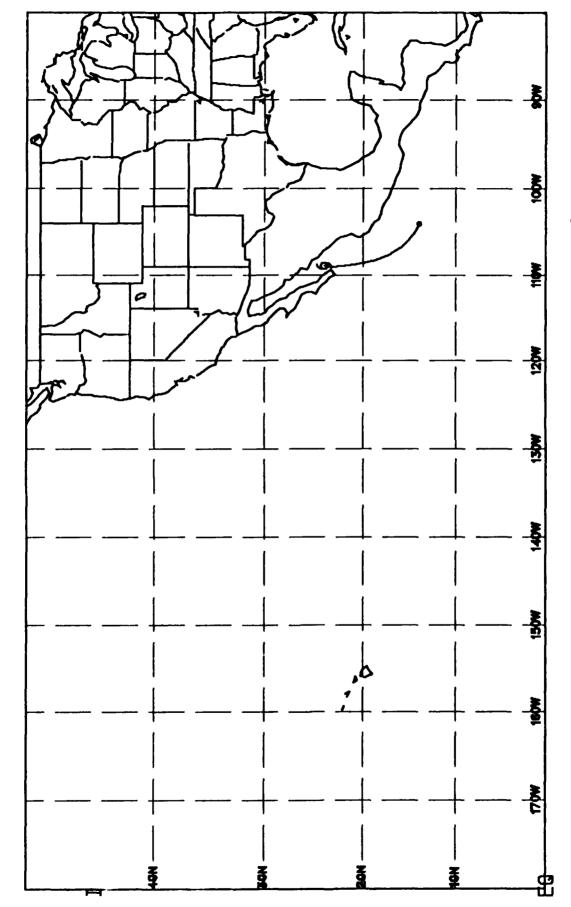


Average tropical cyclone (> 33 kts) Speed (top number) in knots and sample size (bottom number) for each 5° latitude by 5° longitude square. Contours are drawn only to those squares containing at least 5% of the sample.

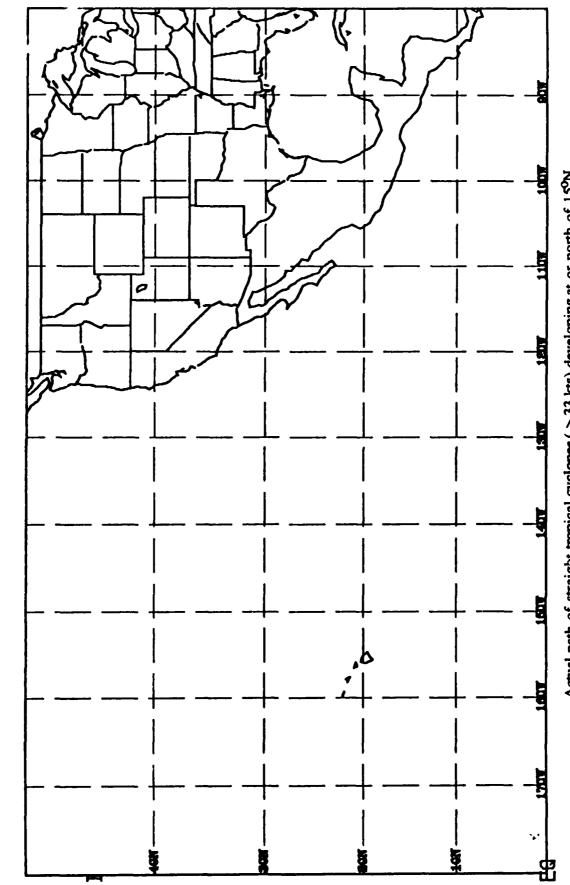
MEAN PATHS FOR NOV 24 - DEC 8



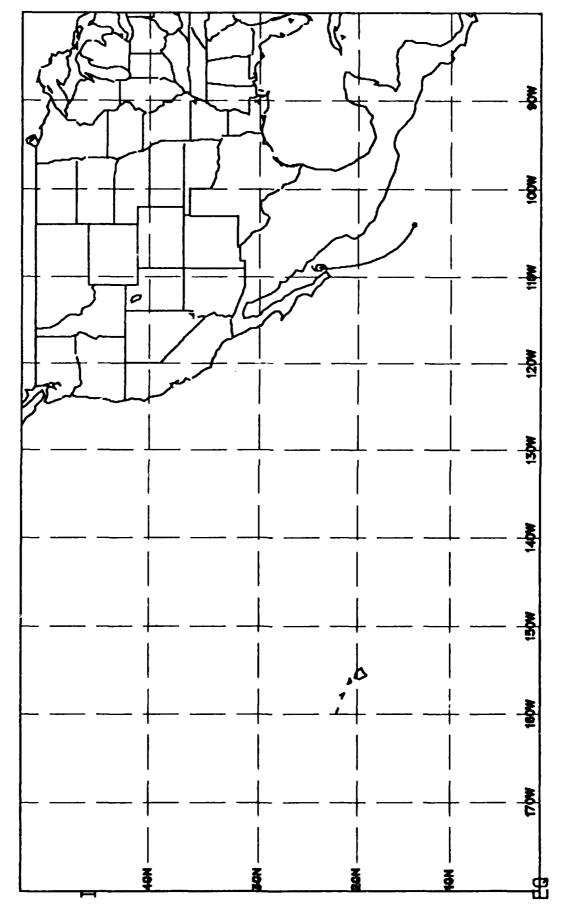
Numbers represent the percentage of tropical cyclones (> 33 kts) numbers may not add up to 100% since not all tropical cyclones develop/dissipate along a path. Tracks which contained less than which followed the indicated path. These numbers in (> 33 kts) follow a mean path and some develop/dis 5% of the tropical cyclones (> 33 kts) are ignored. Mean tropical cyclone (> 33 kts) path.



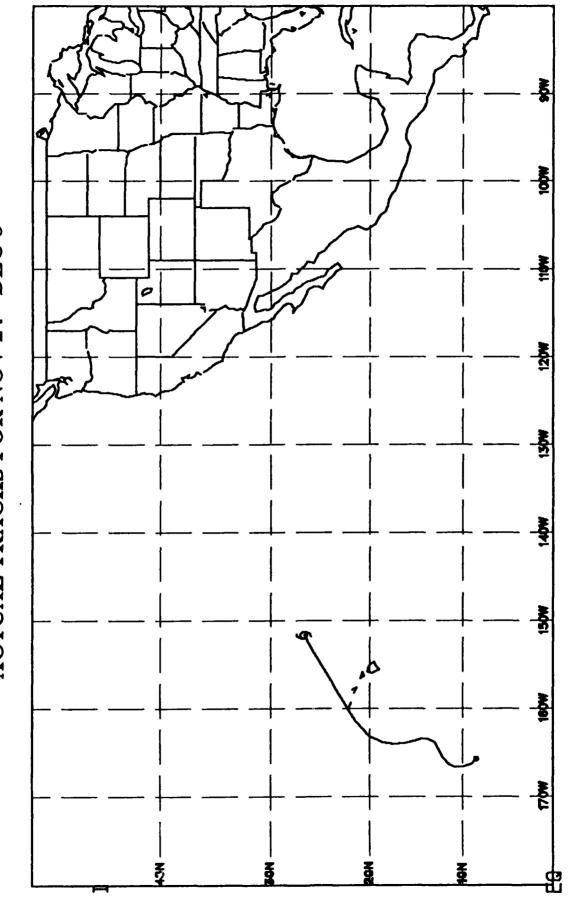
Actual path of straight tropical cyclones (> 33 kts) developing south of 150N.



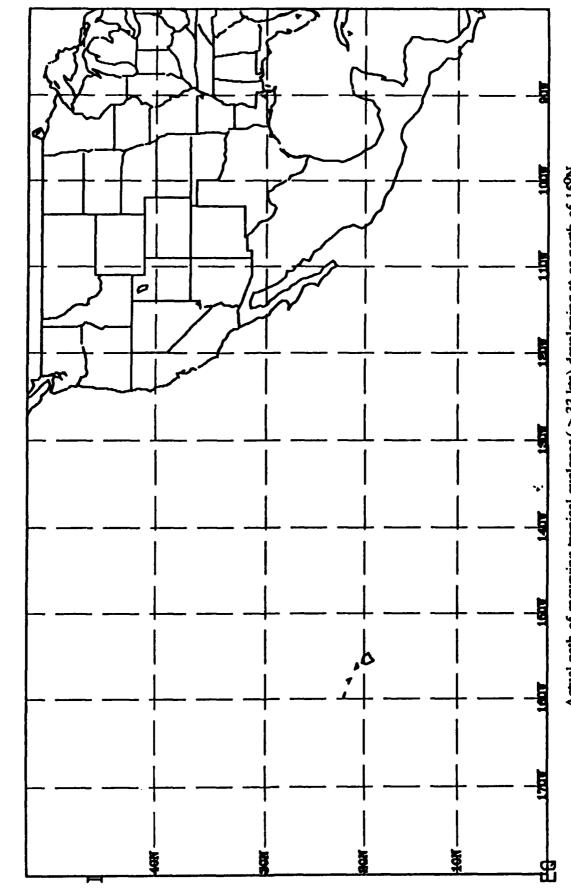
Actual path of straight tropical cyclones (>33 kts) developing at or north of 150N.



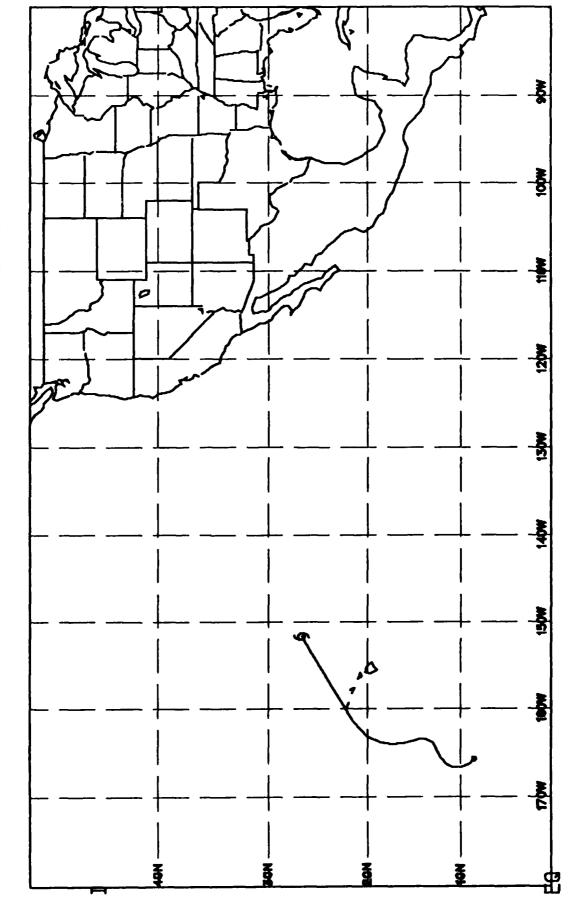
Actual path of all straight tropical cyclones (> 33 kts).



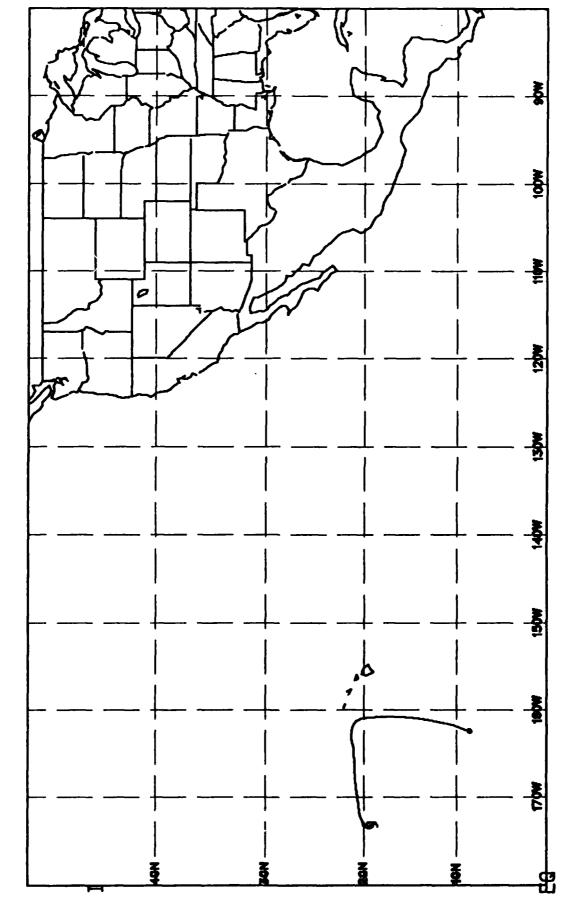
Actual path of recurving tropical cyclones (>33 kts) developing south of 159N.



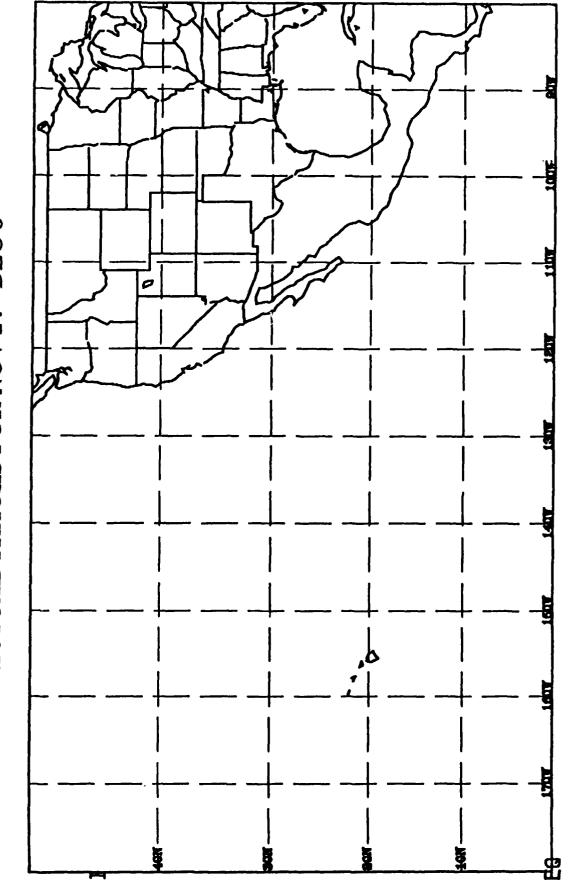
Actual path of recurving tropical cyclones (> 33 kts) developing at or north of 15°N.



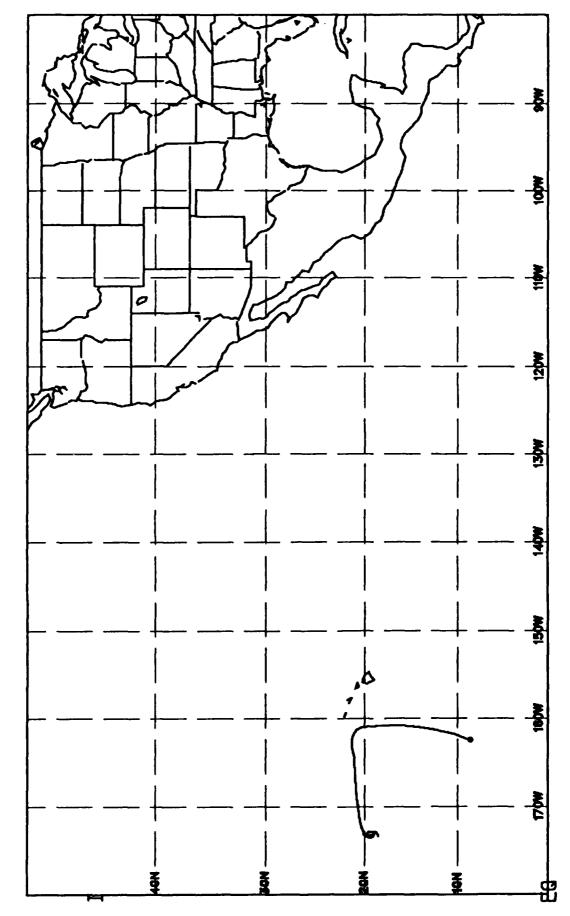
Actual path of all recurving tropical cyclones (>33 kts).



Actual path of other tropical cyclones (>33 kts) developing south of 15°N.

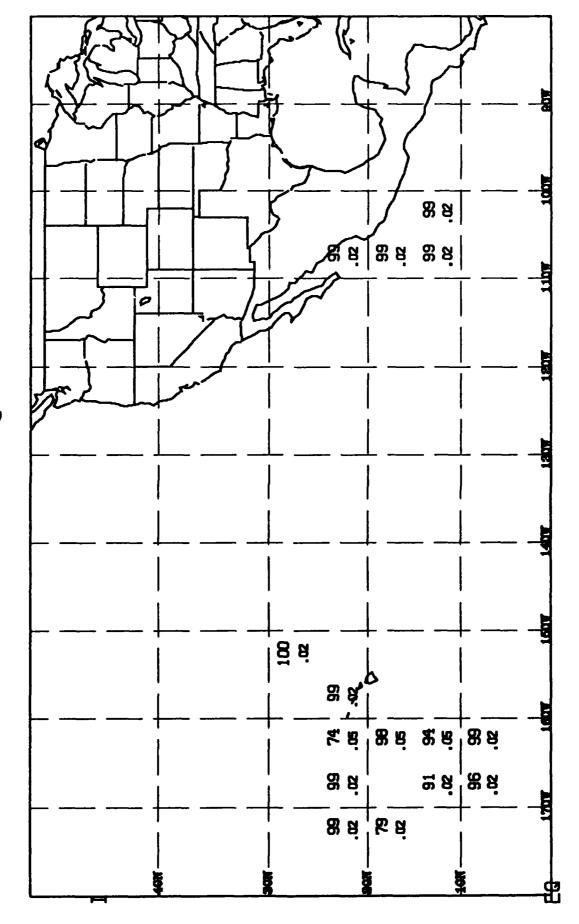


Actual path of other tropical cyclones (> 33 kts) developing at or north of 15°N.



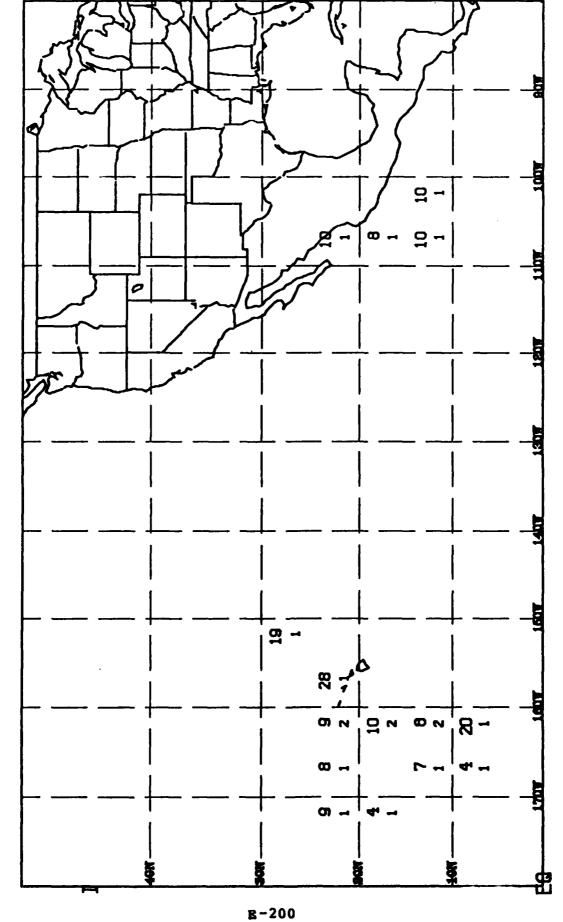
Actual path of all other tropical cyclones (>33 kts).

CONSTANCY AND RELATIVE FREQUENCY FOR NOV 24 - DEC 8

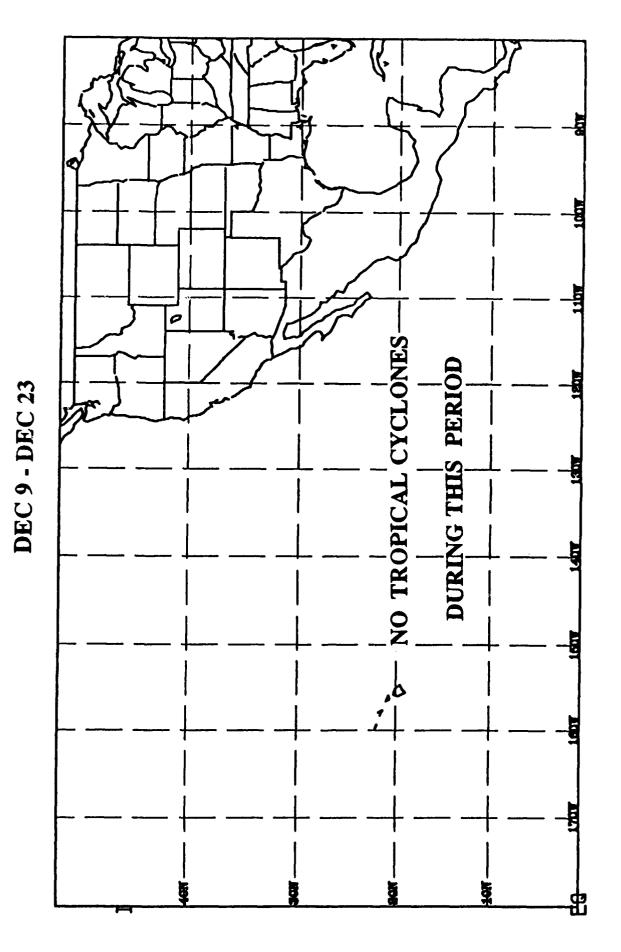


as the 12-hr average vector speed divided by the 12-hr average scalar speed. and Relative Frequency (bottom number). kts) Constancy (top number) Relative Frequency is the number of longitude square per year per time period. Constancy is defined Frequency cyclone **Tropical** Relative

SPEED OF MOVEMENT FOR NOV 24 - DEC 8



(> 33 kts) Speed (top number) in knots and sample size (bottom number) for longitude square. Contours are drawn only to those squares containing at Average tropical cyclone each 5° latitude by 5° least 5% of the sample.



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